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ABSTRACT

This is a preliminary examination of the present status and future prospects of educational technology in Nova Scotian schools. It is aimed at developing a plan to enhance the quality of educational technology by concentrating on systems which will be conducive to realizing educational goals at a reasonable cost. An overview of the institutional background of educational technology and the various aspects of the organization and operation of the Department of Education in the province are described. Existing educational technology resources in Nova Scotia are documented in the following areas: (1) communication and information networks, (2) equipment and facilities, (3) software and materials, and (4) teacher education and resource specialists. Implications of these findings are discussed, and suggestions for developing and improving existing resources are made relative to the design of a broad learning resource base, and to more substantive aspects of technology and educational back-up services in four areas: (1) equipment and acquisition, (2) software access and products, (3) electronic networks, and (4) coordinated resource services. Four major recommendations involve: (1) provision by the Nova Scotia Department of Education for basic supportive services throughout the province; (2) closer integration and coordination of certain departmental programs and activities to strengthen the means of providing these services; (3) provision for software, materials, equipment, facilities, and training; and (4) undertaking another examination of the Educational Technology Program for Nova Scotia at a later date. (DAG)

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EDUCATIONAL TECHNOLOGY PROGRAM FOR NOVA SCOTIA: INITIAL PHASE

A Report on the Federal-Provincial Study Of Educational Technology in Nova Scotia

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Educational Technology Program for Nova Scotia: Initial Phase

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Halifax, Nova Scotia

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MEMORANDUM

TO:

Gordon F. Coles, Q.C.
Deputy Minister
Responsible for Communications

Dr. H.M. Nasor
Deputy Minister
Department of Education

FROM:

Dr. Gaylen A. Duncan
Chairman, Executive Committee
Educational Technology Program for Nova Scotia

On March 6, 1974, you requested that a joint federal-provincial study be initiated with the purpose of examining educational technology to identify principles and procedures which could lead to enhancing the educational process in the Province of Nova Scotia through the cost-effective application of educational technology. We, the members of the Committee, have the honour to report that the Educational Technology Program for Nova Scotia (Initial Phase) has been completed and now take pleasure in submitting the accompanying Report.

The Committee believes this Report to be both a fair and accurate summary of the work completed and a comprehensive statement of the Committee's conclusions and recommendations. As required by the original terms of reference of the Program, the Executive Committee hereby requests that you approve the format and content of this Report and decide upon its disposition and circulation.

Since the initiation of this joint federal-provincial Program, the federal government has terminated the Educational Technology Branch of the Department of Communications. As a result, it is difficult to identify the current or future role of the federal government in this Program. This problem has been identified by the Executive Committee and is discussed in the section of the Report dealing with Phase II.

It is the Committee's recommendation that the Program be continued and that the federal government be kept advised of the scope and progress of Phase II in order to assist it in identifying its role for the future.

It is the Committee's hope that this Report will increase awareness in the developments which have taken place in Nova Scotia and will assist in the understanding of the role of technology in the educational system of this Province. This Report presents the foundation which exists at the moment and identifies the steps which should be taken before any further structures are built.

Gaylen A Duncan

G. A. Duncan

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Preface

In recent years, educators have expressed a growing concern regarding the role which technology should play in education. Two opposing viewpoints are frequently voiced: on the one hand, new technologies such as computers and cable television are said to promise much towards improving the quality of education. Yet, on the other hand, many see technology as having failed to deliver its promise in the past; indeed, some feel that technology has tended to erode the quality of education offered in schools.

The study summarized in this report is an attempt to begin to resolve these views in the context of education in Nova Scotia. The study, entitled Educational Technology Program for Nova Scotia: Initial Phase (ETPNS), consists of a preliminary examination of the present status and future prospects for educational technology in Nova Scotian schools. The ETPNS resulted from the need to understand technology as it relates to education and was made possible through supportive programs on both the federal and provincial government levels.

The scope of the ETPNS can hardly be exaggerated. There is perhaps no other aspect of contemporary life which is more central to the preservation of culture and the advancement of civilization than education. Our perceptions of the world, and our relationship to it, are both subtly and dramatically altered by our educational experience. At the same time, the character of modern society is shaped increasingly by the various forms of technology which it employs. It seems that the goals which people set and the issues which involve them are influenced as much by technology as by anything else. In a country such as Canada, which consists of so many cultures, and where people are separated by such vast distances, education and technology are among the few things which touch everyone; as such, they have an incalculable potential to affect us.

Educational technology, *per se*, is not new. It involves the facilitation of human learning through the systematic identification, development, organization and utilization of a full range of learning resources. Educational technology is also considered as the organizational and conceptual structure through which the management and administration of these resources is achieved[1]. This concept of marshaling resources and directing them in a rational fashion towards the attainment of knowledge is a familiar kind of educational technology.

Yet there is a difference in how educational technology must be treated today: in the past, educators must have had more time to react and adjust to technology in the schools than is available now.

Since the devices which they introduced were relatively inexpensive, and since the effects they had were comparatively limited and predictable, it must have been relatively easy to integrate them into the technological system of the school without disrupting the entire structure.

Just as the technological devices being considered today are so much more costly, and just as their development proceeds at a vastly accelerated rate, so too is their potential to affect us that much greater than was true in the past. Even though this applies to the potentially positive effects of technological devices, surely, it applies equally to the potentially negative effects as well.

The effort of dealing with this great potential impact of technological advance has forced us to view technology in a much broader perspective than previously. It is now essential to use more foresight and to gather more background information before implementing any changes in existing systems. Before any action is taken, the effects must be gauged and the various options considered.

To do this, however, there must be an understanding of the many elements involved in a system of education and how they interrelate. Neither the individual elements of education, nor the school system as a whole, can be considered apart from the other outside elements or apart from the total environmental context of the educational process.

For instance, we might say that the technology of television has the potential to affect education in at least two ways: first, from outside the school, because its information-giving properties are so universal and freely accessible, television can greatly alter the role of teachers and books, and even the basic structure of education itself. Second, when used in the classroom, it has the immediate potential to change people's ways of viewing things and the process of learning itself. Such changes as these are both great and small; moreover, both schools and school surroundings are being affected constantly and at an increasing rate by technology. As a result, our methods of coping with these changes—our organizations, our concepts—have in turn become a kind of technology which can have a significant impact. The legacy of educational technology is not only that it creates changes in a systematic fashion but also that it creates a need to consider technological change from a systematic point of view.

The nature of an examination of educational technology is therefore a reflexive one—the methods of approach are similar to the phenomena being studied. This has forced the pairing of dissimilar combinations of concepts in order to view technology in its entirety. For example, concepts from such disciplines as group psychology and electrical engineering may be required to study the design and effects of educational television thoroughly. Old categories and means of viewing things must be broken down and new ones created (precisely what technology is doing to the schools). Uncommon combinations of people must also be summoned in order to conduct the study.

Because this kind of multi-disciplinary approach may seem unusual, and because the consequences of the decisions may be so great, the participants in a study of educational technology must strive throughout this process to conduct themselves on a particularly humane scale of mutual communication and understanding. Specialists must therefore work hand-in-hand with teachers who, in turn, must work together with students, and the parents of students. Ultimately, all must work together, for inevitably we all must live with the consequences of the educational technology we choose.

Program Approach and Organization

The approach suggested here is not new, nor is it unique to educational technology. What is new is its selection and application in the study of educational technology in the Province of Nova Scotia. The ETPNS was a cooperative effort shared by federal and provincial bodies and by the various teachers and organizations which constitute the school system in Nova Scotia.

The federal involvement was directed through the Educational Technology Branch of the Department of Communications. This branch was formed as a result of a growing concern over communications policies throughout the sixties, which culminated in a federal cabinet directive to the Department of Communications in 1969. This directive instructed the department to cooperate with other federal departments and concerned agencies in preparing a research program designed to provide provincial educational authorities with information on the best transmission system available for educational broadcasting purposes. By then it had become clear that emerging technology demanded a concerted effort at coordination if a high quality and economical technology was to be shared on both national and intra-provincial levels.

On the basis of this committee's recommendations, an Educational Technology Program was given federal cabinet approval on September 14, 1972, contingent on acceptance by the Council of Ministers of Education. On the 12th of February

1973, the Council of Ministers of Education advised the federal Minister of Communications of their willingness to cooperate. The Educational Technology Branch (ETB) was established and given a mandate for 2 1/2 years with a budget of over 2 million dollars. This branch was discontinued on October 1, 1975, as a result of federal budget cuts announced on June 23, 1975.

The ETB managed the Nova Scotia program and provided technical advice in such areas as systems engineering and computer/communications. The ETB was supported by relevant resources of other federal government departments and agencies such as the National Film Board, the National Research Council and the Communications Research Centre. The general objectives of the ETB were:

> to assist provincial and federal educational authorities in selecting the best technological systems to meet their individual needs;
>
> to undertake systems studies and evaluations, and arrange for specific experimental projects in support of program activities;
>
> to collect and disseminate information on educational technology systems;
>
> to define and recommend national standards for educational technology systems.

The establishment of a Nova Scotia program followed informal discussions between Mr. Doug Bassim of the ETB and Dr. Gaylen Duncan, Coordinator of Communications Policy for Nova Scotia. As a result of this meeting, in January 1974 the provincial government requested that the possibility of undertaking a joint program be investigated.

After a series of meetings between federal and provincial officials, it was agreed that a proposal would be prepared to outline the activities and resources required to approach the question of educational technology in Nova Scotia. A number of drafts of this proposal were produced by the ETB Program Manager, Dr. Tony Keefer, and were discussed with several organizations. These organizations were later represented on the Steering Committee (see Appendix A). A joint proposal dated March, 1974, was then produced and was recommended for approval by the Review Committee (see Appendix A) on March 11, 1974. This document was signed on April 23, 1974, by the Minister of Education for the Province of Nova Scotia, the Hon. J. W. Gillis and the Federal Minister of Communications, the Hon. Gerard Pelletier.

The ETPNS Initial Phase had the long-term goal of developing a plan to enhance the quality of educational technology in Nova Scotia by concentrating on systems which will be conducive to realizing educational goals at a reasonable cost. This aim can be amplified in terms of a number of objectives:

> **Needs**—to determine educational needs which might be met by the application of technology;
>
> **Impacts**—to investigate the impacts of current and future technologies on educational needs and programs;
>
> **Design**—to determine the nature of the systems required to meet these needs;
>
> **Rationalizing**—to advise on the most cost-effective and appropriate mix of delivery systems to satisfy these educational needs;
>
> **Flexibility**—to ensure flexibility for growth and for the accommodation of new technologies as they emerge;
>
> **Compatibility**—to ensure compatibility of Nova Scotia hardware systems with each other and with national systems;
>
> **Planning**—to produce an overall development plan which will rationalize and coordinate existing and planned Nova Scotia efforts and resources in the field of educational technology.

To achieve these objectives, a five-stage approach was proposed consisting of the following phases: (1) Initial Phase; (2) Systems Engineering Phase; (3) Pilot Project Phase; (4) Approval Phase; and (5) Implementation Phase. The Initial Phase involving data collection and preliminary systems studies laid the ground work and defined subsequent phases. It was to last from April 1974 to March 1975. The agreement was made on the understanding that neither the Federal Government nor the Nova Scotia Government was committed to continue the program beyond the Initial Phase. In addition, it was agreed that the following general conditions would govern the program:

> The Federal Government would respect the jurisdiction of the Province of Nova Scotia on all matters of educational content.
>
> All studies would be undertaken jointly.
>
> The Province would make all implementation decisions.
>
> Information and results (unless Nova Scotia decided to the contrary in matters of confidentiality) would be made available to others; in particular, the Council of Ministers of Education would be advised of all study results.
>
> All ministers would retain veto powers over the involvement of their personnel in the program.

The management of the program was undertaken through three major committees: the Review Committee; the Executive Committee, which is the working body; and the Steering Committee, which provides a forum for liaison with a number of interested parties. The membership and terms of reference of these committees are included in Appendix A.

The approach followed during the Initial Phase was designed to lay the informational and conceptual groundwork necessary in order to set a firm basis for the work which would follow in subsequent phases. An attempt would therefore be made to define the subject area, to isolate special concerns and to define clearly what steps need to be taken.

Based on the results of the ETPNS studies, some intermediate projects would be developed which could be applied immediately but which could change in the future. These projects would represent a positive step towards incorporating technology into the educational process; as such, they would offer a viable alternative to the immediate implementation of full-scale programs or to an interminable round of studies leading nowhere. These projects would not tend to force any new technique or philosophy upon education in the province but would attempt to lead to the development of proven ideas which would reinforce the long-term development of a philosophy of dealing with educational technology as an integral part of the existing structure of education.

The formal goals of the Initial Phase, as set out by the Steering Committee, were defined in terms of the following questions.

What Exists?—The first task was to document present facilities and past experiences with these facilities in an effort to judge the extent of existing applications of technology.

What are the Options?—The second task was to identify arrangements which would be flexible enough to meet future demands.

What are the Steps?—The third task was to attempt to chart the various paths open towards securing such flexible arrangements.

What are the Implications?—Finally, an attempt would be made to outline some of the ramifications which could be expected from the proposed courses of implementation in an effort to generate discussion and awareness concerning the future of educational technology in the province.

The methods employed consisted of determining needs; presenting an overview of available facilities and resources; collecting supportive data; conducting studies of specific sub-systems; and preparing the recommendations. Projects were undertaken in the following areas: the availability of audio-visual resources in the schools, including a survey of educational equipment, materials and software; network (communications) resources; computers in education; and purchasing and maintenance of educational equipment; and the distribution of audio-visual materials (specific projects in each of these areas are listed in Appendix B).

As background to these reports, numerous working papers were prepared in such areas as the relationship of educational technology to pre-school education; youth education and special education; community involvement; and evaluation of educational technology. These studies were drafted in the context of several briefs submitted by such organizations as the Nova Scotia Teachers Union, the Nova Scotia Federation of Home and School Associations, the Nova Scotia School Boards Association, the Atlantic Institute of Education, and the Nova Scotia Department of Education.

Extensive work was conducted in the field discussing the program with teachers. This work, reported in the **Field Seminars With Teachers** study[3], reached an estimated 10% of Nova Scotia teachers. A special report documenting the views which students held on educational technology was also prepared.

Out of this process emerged a series of proposals and recommendations which provide a preliminary outline of the time-scale, scope, allocation of resources, and approaches necessary to implement further stages in the program. Included here are future projects required, special studies, and issues to be resolved.

Overview of Report

The material in the following chapters is organized along the lines of introduction, findings, possibilities, recommendations and conclusions. An overview of the institutional background to educational technology is provided in Chapter 1 and various aspects of the organization and operation of the Department of Education in the province are described. This is intended to serve as an introduction to the ETPNS findings outlined in following chapters in order to allow placing these findings in a broader historical and administrative context.

The documentation of existing educational technology systems resources in Nova Scotia is covered in Chapter 2. The following areas are covered here:

- Communications and Information Networks

- Equipment and Facilities
- Software and Materials
- Teacher Education and Resource Specialists

The consideration of these resources provides an overview of the current status of educational technology in Nova Scotia.

The implications of these findings are discussed in Chapters 3 and 4 in terms of possible means of developing and improving existing resources. Chapter 3 is an extension of the philosophy discussed in the approach outlined above in view of the findings as related in Chapter 2. Thus, guiding principles and remedial measures which would strengthen the operation of these principles are proposed with the aim of designing a broad learning resource base in the province.

The more substantive aspects of technology and educational back-up services are considered in Chapter 4 within the framework of guiding principles. These key aspects are related to the learning environment on both a provincial and regional level:

- Equipment and Acquisition
- Software Access and Production
- Electronic Networks
- Coordinated Resource Services

The implications and conclusions of Chapters 3 and 4 are summarized in Chapter 5, and four major recommendations are made. These recommendations are meant to summarize and begin developing the numerous proposals and suggestions included throughout the report. These recommendations involve: the provision by the Nova Scotia Department of Education of basic supportive services throughout the province; closer integration and coordination of certain departmental programs and activities to strengthen the means of providing these services; the provision of software, materials, equipment, facilities, and training; and the undertaking of Phase II of the Educational Technology Program for Nova Scotia. Depending upon the projects undertaken in Phase II, this could again involve both the Federal Government and the Province of Nova Scotia.

Footnotes

1. "The Field of Educational Technology: A Statement of Definition", **Audio-Visual Instruction**, October 1972, 36-43.
2. Computer/Communications is an example of the type of interdisciplinary field discussed earlier and involves the study and implementation of interelated computer and communications systems.
3. ETPNS. "Report on Field Seminars With Teachers." Working Paper No. 6425.

1 INTRODUCTION— OVERVIEW OF THE DEPARTMENT OF EDUCATION

In the discussion to follow, a variety of institutions and technological devices will be considered. An understanding of these institutions, and the historical background which shapes them, is essential to the understanding of educational technology. Just as technology influences our way of viewing and organizing our institutions, they, in turn, influence the organization and effect of educational technology.

As the results of this study unfold, it will become clear that most of the effort has been directed towards the aspect of technology **in** education, rather than the technology **of** education. This should not be interpreted to suggest that the broader sense of educational technology, or the sense of institutions as technological bodies, is not important. The findings of this report will ultimately have to be integrated with the overall educational planning of the province. Although the major concern in this report is with technological resources, particularly audio-visual systems and devices, this is based on the understanding that the institutional framework of technology in Nova Scotia has been covered elsewhere, in far greater detail, than could be provided in a summary report such as this.

Even though the institutional side of technology is beyond the scope of the study, it cannot be entirely neglected. Rather, a brief overview of this aspect of education is drafted in this chapter. A general indication is provided in the final chapter as to how this relates to the present program. The final integration of the institutional side of education is perhaps the role of subsequent phases of the Educational Technology Program. This report has a more immediate role to play in terms of discussing the array of technological devices in the schools and methods of using and organizing these devices more effectively. The goal is to lay the groundwork for as thorough and as systematic an understanding of educational devices as is now possessed for education in general.

Nova Scotia is now in the unique situation where those in authority can study and plan the kind of technology they wish to make available in the schools rather than simply reacting to a pre-existing technology. They are thus in a position to introduce elements of technology which are likely to be of benefit and to reject those elements which are likely to be useless or harmful. From the planning process itself there will emerge, as a by-product, a wider understanding of the nature of technology than the current commonly held notion which equates it simply with audio-visual systems. This

shift in perspective would, in itself, be an aid towards producing more substantial and long-lasting benefits from the deployment of educational technologies.

The approach adopted in this study is not one calculated to guarantee that either more and newer elements of technology will be introduced into the schools nor that the schools will necessarily be better for having them. It is nevertheless an attempt to ensure that if technology is introduced then it will be beneficial. To do this we must attempt to keep firmly in mind both the characteristics of the new technologies **and** the institutions which satisfy the educational needs of the people. Only if we have a clear understanding of both is there any likelihood that we can ensure that one will complement the other.

.1 The Administrative Framework

Publicly supported education in Nova Scotia has a history which stretches back nearly two centuries. The system of free schools, nominally accessible to all children, dated from 1864. Schools were required to be maintained in each locality and were supported by local taxation, supplemented by grants-in-aid from the Province. Rural municipalities were divided into sections of a size which would enable all children in a section to commute on foot between home and school. Schools in each of the sections were managed by an elected board of trustees. The trustees were responsible for school building and maintenance, employment of teachers, determination of elements of curriculum, and classification of pupils, subject to the general oversight of a Board of School Commissioners in each municipal unit and a provincial Inspector of Schools appointed for each county.

Also at the provincial level, the Executive Council acted in the capacity of a Council of Public Instruction, with general responsibility for educational policies and practices. Its decisions were carried out by an executive secretary, who was designated Superintendent of Education.

These administrative provisions, with fluctuating but generally increasing degrees of provincial support and control, continued for almost a century. During this interval, a common provincial curriculum was established and secondary elements incorporated whereby the Province assumed responsibility for the certification of teachers, and established provincial examinations within the system. Technical instruction was also established (*circa* 1900) and the Province began to provide a number of ancillary services to local authorities (*e.g.* school radio broadcasts, consultant services in rural education, shopmobiles, and special grants for pupil transportation and rudimentary school libraries).

During the 1930's it became apparent that the small school sections did not have adequate financial and human resources. A commission was appointed in 1939 to examine the feasibility of larger administrative units. As a result of its report, responsibility for the maintenance and operation of schools was transferred during the 1940's to school boards whose jurisdiction was coterminous with that of urban and rural municipal units. These "larger units", together with three experimental amalgamated boards (each of which operate the schools of several municipal units), remain in 1975 the local units of school governance in Nova Scotia. At the provincial level, a separate Ministry of Education was established within the government structure in 1950 with the Deputy Minister of Education assuming the functions and responsibilities of the former Superintendent of Education.

Within the jurisdictions of the municipal units, a system of large consolidated high schools, with supporting systems of pupil transportation, was established in the 1940's and 1950's, and this was accompanied and followed by consolidations of the elementary "feeder" schools. In the 1960's, most of the units of a parallel system of 13 regional vocational schools were established by the Ministry of Education, 11 of which continue to be operated by the provincial authorities.

The larger units of administration generally equalized educational opportunity within municipal units, but not between them, and there remained great regional disparities. A royal commission to study school finance was appointed in 1954. Its recommendations resulted in the establishment of a "Foundation Program" whereby the Province shares with each municipality the costs of providing a defined set of basic educational services, the Province's share being in inverse ratio to the municipal units' ability to pay as determined by an equalized assessment of real property. To ensure that there would be some degree of provincial funding for all school boards, the Province's share was set at a minimum of 25 per cent (later 27 1/2 per cent). The Foundation Program thus had the effect of roughly equalizing educational opportunity with respect to mandatory services—though not with respect to optional services—across the province.

These provisions for local school governance and for educational finance—as modified by legislation;

studies by the Department of Education; consultants' reports and commissions; historical precedents; and variations in local procedures must be taken into account in any attempt to understand the relationships between technology and education in the province today.

.1.1 School Administration, Procedures and Organization

In practice, the administration of education in the province is shared by the school boards and the Ministry of Education. The statutes governing public education assign specific powers related to the initiation of policy, coordination and control severally to the Governor-in-Council and to the Minister of Education, who must give approval to policies before they are implemented. The minister acts as the head of the Department of Education and speaks for education on the floor of the legislature.

On the other hand, it is the local school authorities who manage and have exclusive control (subject to the regulatory authority of the Province) over the schools in their respective areas. These local school authorities give expression to the policies which are set by the department and may adapt these policies somewhat in the administration of schools on a day-to-day basis. The school authorities also have a high degree of discretion and autonomy in other areas, such as the hiring of teachers and the construction of new schools. This can have a considerable bearing on the education provided in any given area.

School administration is therefore a balanced responsibility between provincial and local authorities. Each has separate and shared responsibilities, the outcome of which determines, in a very real fashion, the quality of education in any given region.

Although there are various kinds of local school authorities in the province, in practice they operate in much the same fashion. In general the school authorities are appointed, the responsibility for the appointment being shared more or less equally by the province and the municipality.

The school authorities may also initiate programs over and above those funded by the Foundation Program. It is through the relationship which develops between the local authority and the provincial authority that decision-making concerning the school proceeds on a day-to-day basis.

.1.2 Organization of the Department of Education

In the late 1960's the Department of Education adopted a system of program planning and budgeting as a means of planning and controlling its operations using modern management techniques. At the same time the Department of Education was reorganized to establish clear definitions of departmental programs and activities for purposes of strategic planning, detailed programming, budget preparation, provision of information, and strict monitoring, control and evaluation of programs.

The present structure of the Department of Education is outlined below.

Associated with the Deputy Minister to form a Senior Management Group which advises the Minister of Education, are the assistant chief directors in charge of three major program areas: education programs, the planning and budgeting program, and the finance program. A program is a group of related activities and services.

The education program area comprises four programs: youth education, adult education, teacher education and cultural services.

The Youth Education Program is concerned with the functioning of the regular public school system. There are distinct offices or "activities" dealing with elementary education, secondary education, secondary vocational education, consultant services, pupil personnel services, audio-visual instruction, and the school book bureau.

The Adult Education Program is concerned with the provision of continuing education for adults in a great variety of academic, cultural and general fields; vocational education for adults, including those under the Manpower Training agreement; and applied arts and technology education.

The Teacher Education Program develops and co-ordinates pre-service and in-service education for teachers. It operates the Nova Scotia Teachers College and the Nova Scotia Summer School.

The Cultural Services Program includes those agencies and activities which maintain and administer the cultural resources of the province that are serviceable to education. These include the Nova Scotia Museum, the Nova Scotia Provincial Libraries, and Audio-Visual Services.

The purpose of the Finance Program is to administer the department's budget, to control its internal financial operations, and to administer and monitor the financing of educational programs carried out by school boards with the aid of provincial grants. This program includes activities concerned with public education grants, inspection services, school planning and conveyance, administration and accounting, teacher's pensions, and student aid.

Although each of the activities of the department

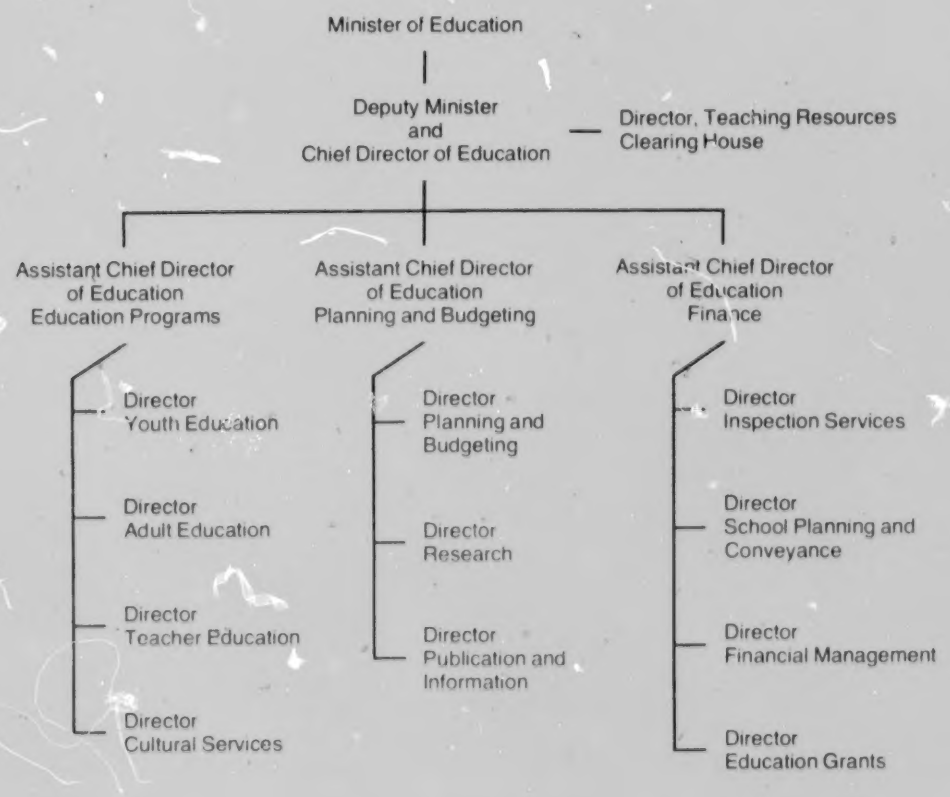
is concerned with a particular responsibility, in practice all are interdependent and the department acts as a unit; often activities of all six programs cooperate to furnish the information and advice required to make a single decision. To make possible this close co-operation, the Planning and Budgeting Program provides research and communication services within the department and within the school system; it also maintains the department's long range planning machinery for the constant review and shifting of priorities for budgeting and for a close surveillance of budget management.

Final decisions in matters of policy respecting public education are made, under the provisions of the appropriate statutes, by the Governor-in-Council or by the Minister of Education.

Briefly, the goals of the Department of Education are to provide a program of public education which will meet adequately the needs of all pupils; to assist selected non-public school educational organizations; to provide other educational services such as technical institutes and the Nova Scotia Teachers College; and to develop long-term plans and objectives for all aspects of education in Nova Scotia.

In order to accomplish the goals of Youth Education, an organizational structure consisting of elementary schools (grade levels primary to six), junior high schools (grade levels 7, 8, 9) and both senior high schools and regional vocational schools (grade levels 10, 11, 12) has evolved within the province. Most elementary schools are now committed to the principle of continuous progress and are

Figure 1- 1. Department of Education


Minister of Education
Deputy Minister and Chief Director of Education
Director, Teaching Resources Clearing House
Assistant Chief Director of Education Education Programs
Assistant Chief Director of Education Planning and Budgeting
Assistant Chief Director of Education Finance
Director Youth Education
Director Adult Education
Director Teacher Education
Director Cultural Services
Director Planning and Budgeting
Director Research
Director Publication and Information
Director Inspection Services
Director School Planning and Conveyance
Director Financial Management
Director Education Grants

stressing greater individualization of instruction and more spontaneous and self- directed learning.

Junior high schools offer modified programs in addition to the standard academic programs. These programs are aimed at eliminating weaknesses in particular subject skills. Adjusted programs are also offered in order to provide a level and pace of instruction appropriate for students who have not found in themselves a kindly response to more abstract academic learning.

High school students may choose courses with a view to preparation for university or may elect to follow a general overview of subject areas. They may also enter specialty areas such as business or industrial education. Or they may elect any feasible combination of courses in any or all of these areas, provided such combinations include courses in English (or in French and English in Acadian Schools). In vocational schools the emphasis is upon the acquisition of a wide range of occupational skills.

Various other programs are also provided both within and outside the regular school system. Special education is devoted to the particular needs of gifted children and those with various kinds of learning disabilities or mental or physical handicaps. Classes in adult education are offered in a variety of areas from traditional vocational and academic training through art, music, drama, handicrafts and life skills. Vocational and trade training is also provided under a federal-provincial manpower training agreement.

The Department of Education is also responsible for the Nova Scotia Museum system and the Nova Scotia Provincial Libraries. The Nova Scotia Museum has its main exhibits and headquarters in Halifax, but the system extends throughout the province and includes not only museum displays but also a number of historic sites. The Nova Scotia Library system has eleven regional libraries which serve over 90% of the province's population. The system includes a Teacher's Library and a Legislative Library in addition to the regular collections and technical and reference services.

.1.3 Teachers

Teachers are, of course, fundamental to the system of education and are particularly important in the scale of priorities as set by the Educational Technology Program for Nova Scotia. Teachers, their students, and the relationship they develop around the process of learning are conceived of as the central operational key to the system of education.

Teachers have recently gained access to an additional means of improving the learning process by negotiating a Program Development Assistance Fund (PDAF) through the Nova Scotia Teachers Union. The fund is provided by the Department of Education at the request of the Nova Scotia Teachers Union, and is administered by the NSTU through an awards committee on which the department has representation. This promises to give the teacher greater resources to apply to innovations related to the learning situation. Other recent moves have included a greater emphasis on in-service education so as to ensure a continuing learning process after formal certification is gained.

Teaching certificates are usually granted after 3 or more years of academic and professional training beyond grade 11. Teachers may qualify by attending the Nova Scotia Teachers College in Truro, any of the universities in the province, or selected universities outside the province.

Emphasis on teacher education is crucial in terms of both the quality of the learning process itself and in terms of the requirement of teachers to adjust to the rapidly developing technology which is presenting itself in the schools. This theme is developed in following chapters. Emphasis is given to both the problem of teacher education in dealing with emerging technology and the question of enhancing the learning process itself.

.2 Significant Aspects of Nova Scotia Education

In 1954 a royal commission to study school finance was established. The result of this commission was the inauguration of the Foundation Program whereby the Province and municipalities share the cost of education. The Foundation Program is probably the most significant recent innovation introduced to the school system, it is also one of the more central aspects underlying the operation of the Department of Education. The objective of this program is to provide a basic level of education within the province regardless of the abilities of respective local municipalities to pay for such a service.

Essentially, the Foundation Program represents a formula for harmonizing the relationship between provincial and local administrations. Under this system, provision has been made to establish a stability in education within the province with acceptable standards everywhere. At the same time a

method has been developed whereby local administrations can set their own educational standards and provide for an education which is consistent with their particular needs and priorities.

This is a familiar arrangement, where the fiscal strength of the senior government is drawn upon, yet simultaneously a measure of local autonomy is guaranteed. The balancing of funding and administration between local and provincial levels in Nova Scotia is orchestrated to a considerable extent by the Foundation Program. It is likely that a similar "partnership" arrangement will be involved in the event that new applications of technology are incorporated within the educational system. However, the form of any such arrangement will almost surely involve cooperation not only within the province, but also between the province and the federal government.

The Foundation Program is a significant educational fact in Nova Scotia since it is the cornerstone of educational management. It is through the funds provided by this program that each area finances its educational goals and operating procedures. The goals of existing educational programs are tailored to the rate of sharing as established by the Foundation Program; it is with the assistance of this program that municipalities everywhere finance their school operations. As a result, less prosperous communities can hope to provide a higher standard of education than they might otherwise afford; on the other hand, more prosperous communities have the option of increnienting their foundation allotment from local funds if it seems desirable and feasible.

Under the Education Assistance Act of 1969 a committee appointed by the Minister of Education reviews all school board budgets and makes specific recommendations annually regarding the amount of grants to be made under the Foundation Program. Special provisions for emergencies and other considerations are made now as well.

.2.1 Recent Developments in Nova Scotia Education

Since the inception of the Foundation Program there have been two other developments which are interesting both in terms of their relative novelty and in terms of their potential to affect education. The most recent development is the report by the **Royal Commission on Education, Public Services and Provincial-Municipal Relations**[1], commonly referred to as the Graham Commission. The commission's mandate was to undertake a comprehensive investigation of public services in Nova Scotia, particularly education, and to make recommendations on changes to upgrade the services provided in these areas.

Among its recommendations, the Graham Commission would replace the Foundation Program entirely by making the financing of education a provincial concern. Should this and the many other recommendations be acted upon, the structure of education in the province would change dramatically.

These recommendations have already had a considerable impact since they are so strong and controversial as to have provoked a wide-scale discussion of their feasibility among people at all levels of education. As such, they have wrought a new awareness of education among the many who have followed the commission's report and the subsequent discussion.

The second development, the adoption of the Total Educational Program Development System for Nova Scotia (TEPDS), has involved certain changes within the structure of the Department of Education and a substantial shift in policy with respect to local involvement in school programming. Basically a method of developing, sharing and channeling educational resources within the province, TEPDS has the potential to alter the structure of both curriculum development and teaching practices.

The ETPNS was concerned with developing both a flexible and comprehensive approach so that the findings of this phase, and any subsequent phases, would be consistent with both the practices established by TEPDS and any, or all, of the recommendations of the Graham Commission (should these recommendations be implemented). Thus the study was to be a kind of catalyst in relation to these two other developments in that it would integrate concerns raised by these programs with new developments as they emerged.

The proposals suggested later in this report are flexible and function independently of whether, for example, eleven county administrations in Nova Scotia are adopted, as the Graham Commission suggests. The effects of shifting the responsibility of local decision-making out of the hands of the present school boards or the elimination of compulsory schooling have also been considered as they affect the present recommendations. The proposals here are meant to fit into a discussion of the proposals raised by the Graham Commission and can both illuminate the discussion of these proposals and be accommodated by any subsequent decisions.

.2.2 Total Educational Program Development System for Nova Scotia

TEPDS evolved out of an independent study in 1970 which evaluated the provision of educational services and suggested future provincial educational policy. TEPDS is designed to encourage more direct participation in educational program development by teachers, local school authorities, students, and members of the community-at-large. The scope of this participation is intended to be flexible and to encompass such areas as curriculum development, in-service teacher education, and educational innovations in such areas as teaching methods, evaluation, information flow, learning environments, and so forth.

The main focus of TEPDS is towards the teacher, who is considered central to the educational program. The major goal is therefore to provide teachers with enough support to enable them to exercise initiative in educational development and to have more responsibility to involve students, school officials and community members in the process of education.

The design of TEPDS has many significant features, among them the inclusion of procedures which recognize the right of the local school system, teachers, and community to be genuinely consulted in advance of any change (including province-wide changes) which could affect them or their students. It also recognizes the need for the school inspector and other officials of the Department of Education to be fully informed about innovation and development while providing for autonomy on the part of teachers through independent project budgeting procedures.

One internal mechanism offered by TEPDS provides a means of facilitating rapid access to information about education and educational resources—both within and outside the province. The goal is to have resource people, teaching-support materials, media, and well developed innovative ideas in the province in a readily accessible file so that anyone concerned with education in Nova Scotia will be able to obtain information and assistance in a quick and easy fashion. This facility is called the Teaching Resources Clearing House, or TRCH.

The design of the TRCH is flexible. It is intended to be a central remote-access directory to resources for program and professional development; to provide information on and access to resources, persons, and projects; to provide a mechanism for local, provincial and community participation in educational programs; to establish an information bank from semi-annual reporting; to provide a mechanism for organization, financing and operation of resource centres at regional levels; and to assist in development of an overall co-ordinated plan for use of educational technology. Procedures have been established so that it can grow in sophistication and complexity as the program and the resource information file grows.

The TRCH has been given the responsibility of administering grants to local school boards for projects in program innovation and development. Once a project is approved, the project director is then free to proceed on an independent course of development. Teachers are therefore involved in designing program innovations and are charged with the effective use of funds provided through this channel for program development. As of September 1975, some 220 projects in program innovation and in professional development have been funded by TEPDS grants totalling $217,000.

By virtue of their program development, resource sharing, and communications functions, TEPDS and educational technology are highly interdependent. In recognition of this, the Educational Technology Program for Nova Scotia proceeded upon a base which took the TEPDS approach into account. Examples of this approach are the concept of local teacher consultation on educational development and the mechanism of resource sharing and resource base development; these are vital aspects of the ETPNS Initial Phase study.

In the future it is expected that these concepts will become re-affirmed and that new concepts integrating these two programs—such as educational technology in curriculum development—will emerge. An orienting mechanism for the coordination of the resources within the department is central to new developments in educational technology.

.2.3 The Graham Commission and Steps Beyond

The Graham Commission's report on education was tabled in June 1974—three years after the creation of the commission in early 1971. It was therefore possible to relate the findings of the Graham Commission with the later stages of the Initial Phase of the Educational Technology Program for Nova Scotia.

The Graham report presents a sweeping and detailed look at education in the province and has produced an extensive list of recommendations in line with the broad scope of the enquiry. What is perhaps characteristic of the Graham report is that, while it is very concerned with the future of education, and while it proposes to introduce some highly innovative mechanisms to deal with education, it is basically concerned with preserving and reinforcing

a number of time-tempered ideas as to what education should be. It is therefore an interesting mixture of avant-garde and traditional thinking.

The report is much concerned with the quality of education in the schools and the effects it is having upon children. It asserts that the school must return to the more basic role of providing the pupil with essential life-skills. Most of all, education must provide a sense of being and belonging in what has become, according to the report, a very complex world. The report also recognizes that the assimilation of facts, as simply the raw material of knowledge, will not help people deal with many of the problems facing them today.

The Graham Commission attributes many of the problems now found in the system of education to a too-willing acceptance of such advances as consolidated schools and school buses, as well as to a technically-oriented school system which stresses certification in terms of a limited range of job skills over basic educational goals such as the ability to think critically and imaginatively and to communicate well[2].

The Graham report stresses that Nova Scotia should not attempt to take the lead in technological applications. A return to a more community-oriented focus of learning is advocated; this would simultaneously place the pupils in closer proximity to their homes and to the things which make home meaningful to them. The report also recommends such things as an alternative to school learning, where the pupil would be allowed to leave school in order to pursue knowledge in some sort of apprenticeship program or a similar attachment to a learning situation available in society as a whole.

Of course, the Graham Commission has more to say than this. But the aspect of restraint on new developments and an emphasis on a more human scale to learning is perhaps most important to a study on educational technology in the province. Nobody at the time that regional consolidated schools were proposed in the province seemed able to foresee the kind of results that the Graham Commission described. The consolidated school was supposed to offer the very best in education at the time of its introduction. Yet the report documents numerous tales of displeasure and woe related by parents and children regarding school buses, the long distances travelled, and the anonymity of centralized schools. The lesson is clear: things are not always what they appear to be and it is often too late to reverse the unforeseen consequences of technological advance.

It is perhaps important to a study on educational technology that the impersonal image projected by consolidated schools is closely associated with the negative aspects perceived by some in such technologies as computers and television programming. This suggests the possibility that the shortcomings of technological advances are related; if so, the relationship may well be their lack of responsiveness to the individual or community needs these technologies were designed to serve. It is therefore encouraging that the approach and results of the ETPNS study raised concerns and proposed solutions much along the lines of the Graham report. For example, the Graham Commission recommended that a study similar to ETPNS be conducted and that it be conducted jointly by federal and provincial authorities[3]. In the same recommendation the commission proposed not only a multi-disciplinary approach to the problem but also an earnest attempt to involve teachers at the school level. This kind of agreement is encouraging and reinforcing in that it strengthens the common belief that although the decisions to be made may be difficult, there is nevertheless a consensus regarding the final outcome and how it can be reached.

Footnotes to Chapter 1

1. **The Royal Commission on Education, Public Services and Provincial-Municipal Relations**, John F. Graham, Chairman, Queen's Printer, Halifax, 1974.
2. *Ibid.* See Chapter 55, 43-44. See also Vol. 1, pp. 202.
3. *Ibid.*, Recommendation III/57/1.

2 TECHNOLOGICAL RESOURCE DOCUMENTATION

The later half of the ETPNS study fulfilled two objectives: (1) it enabled the program investigators to translate background principles into an operational approach; and (2) it began the task of documenting existing Nova Scotia resources and establishing a basis from which programs and proposals could be projected. An accurate assessment of the current state of resources within the province was a pre-requisite both for future resource development and in order to conduct a preliminary evaluation of the efficacy of the present situation.

The study associated with this stage of the investigation focused on two key aspects of educational technology in Nova Scotia. First, the supply of equipment and facilities related to educational technology in the province was examined. This is the foundation upon which educational technology may be built and take form. Thus, equipment holdings such as cameras, projectors, and computers were surveyed and accounted for. Second, the area of software and expertise, or the superstructure of educational technology in the province, was documented. In this way a reasonably accurate assessment of the characteristics of the physical resource base and how it was animated could be obtained.

The findings in these two areas are treated in turn in the following pages. From this a preliminary model of the current state of educational technology in the province will be drawn as an analytical base from which to make the projections on future development.

.1 Foundation—Communications and Information Networks

Paralleling the educational system across the province is a communications and information system which is equally pervasive yet which, so far, has had a relatively limited application in the educational sphere. These networks are important since their potential effect is so great and since the future of educational technology is very likely to hinge upon the utilization of these resources. An understanding of these networks is necessary in order to view the long-term implications of software and equipment holdings and how these holdings relate to the overall development of educational technology in the province.

The networks examined here are most often characterized as telecommunications systems. These systems invariably depend upon some communications medium, whether it is broadcasting

over-the-air, or transmission through cables or telephone wires. Most homes have one or the other and therefore may sometimes be considered as part of a telecommunications network. Just as these networks serve the homes, so too they are able to serve the schools.

2 Television Broadcasting

The first provincial school telecasts, offered by the Department of Education through the CBC network, began in the fall of 1962. Today, almost 12 years after their beginning, the CBC educational telecasts cover a wide variety of subjects with a total of 7 1/2 hours per week of air time, servicing students from Grades 3 to 12 as well as a considerable number of adults. The Department of Education must pay all direct costs and must provide the content for each program.

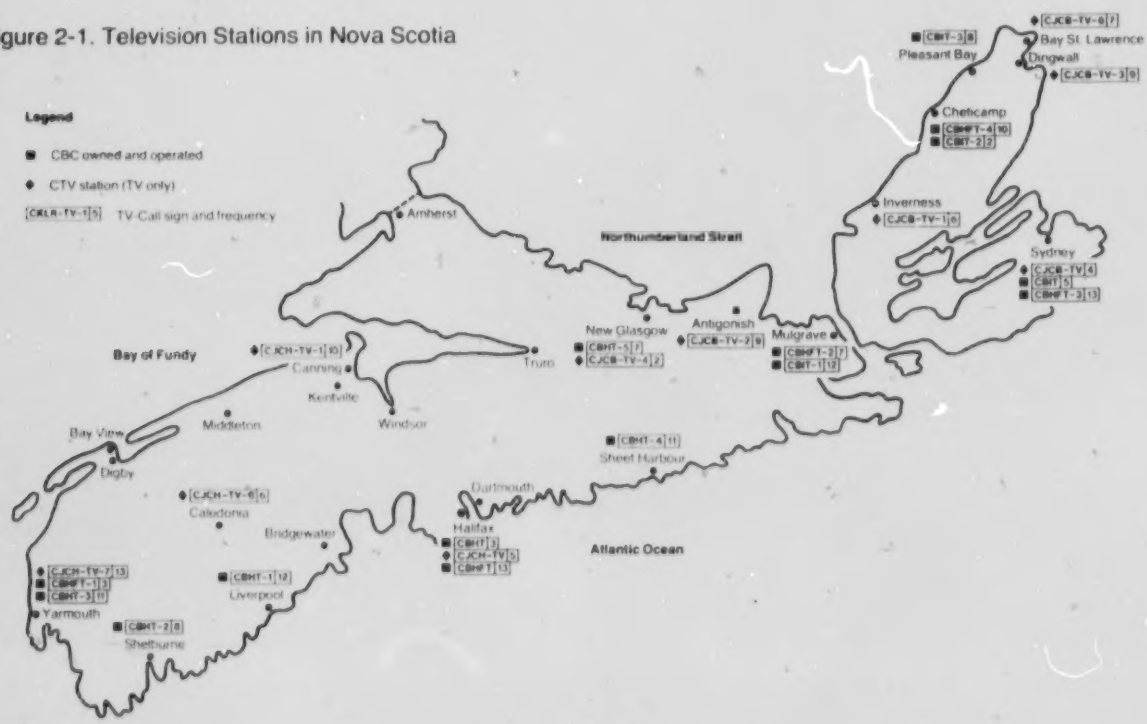
The daily Educational Television (ETV) time slot is from 9:30 to 11:00 a.m. One hour of the total time each week is occupied by the Canadian School Telecasts. No other provincial Department of Education offers this number of educational television programs through the CBC network (although some provinces offer more through their own educational networks). One half hour is taken weekly on radio by the Canadian School Radio Broadcasts.

With the exception of several identifiable areas of the province, the CBC English television regional network covers most of Nova Scotia, while CBC French television covers the areas of Yarmouth, Halifax, Muigrave, Sydney and Cape Breton under the Accelerated Coverage Plan in the province. Improvements are planned in the French television network, with new rebroadcasters designed to serve most of the French-speaking population.

Two ETPNS studies were undertaken to determine the quality of the picture provided by the CBC network in Nova Scotia and to survey the number of television sets owned by the schools in the province[1]. The survey of Nova Scotia schools indicated a low ratio of television sets to students in schools. The survey showed that 526 schools (86% of the total), with an enrollment of 180,000 students, have 878 television sets, almost all of which are monochrome (black-and-white). On the average then, there is only one set per 205 students; 14% (74) of the schools which answered the survey reported that they did not have any television sets at all.

Of the total number of schools responding, 56%

Figure 2-1. Television Stations in Nova Scotia



indicated that some students watched the educational television programming. As noted in Table 2-1 below, by far the greatest amount of viewing is in the elementary schools. Not only are there more programs designed for the early grades, but each program draws a greater number of viewers than those at the more senior levels. The most "popular" program was Social Studies for primary to grade six, with a viewing audience of about 32,000 for each of the programs in April 1974 (the specified reference period). The total possible audience was 115,000, the enrollment in primary to grade six. In contrast, fewer than 2,500 students out of a potential 50,000 watched the Junior High Science program. A smaller proportion of high school students watched the programming designed for them. Two programs for junior and senior high drew fewer than 1,000 students each, out of a potential of 90,000.

Another finding of the ETPNS is that, in several areas of the province, the quality of the CBC television signal is below acceptable standards. Even though several Nova Scotia counties are served by CBC transmitters located outside the province, this does not resolve the basic problem of signal strength drop-off in numerous inland and remote areas of Nova Scotia. Such areas as Digby and the Annapolis Valley, Yarmouth, rural Pictou County, western Cape Breton, and Guysborough County often experience poor signal quality. Signals in many of these areas will be difficult to improve owing to the transmission barriers presented by land forms.

As a backdrop to these findings is the ever-present difficulty which teachers have of scheduling classes around transmission times. Classes and relevant programs cannot always coincide as television programming is presently structured.

More television sets and greater transmission capacity, *per se*, would therefore not solve the problem of educational television in Nova Scotia. Either a more flexible broadcasting mode, or more flexible classroom schedules, must be provided to enable the best use of television programming. Of the many possible approaches to this question perhaps Cable Television technology is most promising.

Table 2-1. Number of Students Viewing Educational Television Programs

Program	Level	Number of viewers[1]	Potential viewers[2]
Art	primary-grade 6	20,300	115,100
Social Studies	primary-grade 6	32,200	115,100
Science in Action	grade 3-4	15,200	34,600
Language Arts	grade 4-6	16,300	53,700
French	grade 5-6	2,600	36,100
Science Fair	grade 5-6	12,600	36,100
Junior High Science	grade 7-9	2,200	52,900
Adventures in Math	grade 6-12	800	107,500
Communication	grade 7-12	800	89,400

1. One student may be viewing more than one program.
2. Enrolment in the respective grades.

.3 Cable Television

Cable Television, or CATV as it is commonly called, has two main functions: (1) it receives off-air signals and delivers them to subscribers via a coaxial cable; and (2) it is involved in packaging and delivering programs (commonly known as closed circuit television). Cable distribution began in Canada in 1952 in London, Ontario, and in Montreal as a response to the problem of unacceptable signal reception by television sets in areas cut off by distance or obstructions such as mountains or skyscrapers. As a result, a local entrepreneur would erect a tall antenna on high ground near the town or city, amplify the signal he received, and deliver it to homes via coaxial cable for a monthly fee. Thus, in the early days it was known as Community Antenna Television, or CATV, a term which has lingered on to the present day.

The cable transmission link has a much greater channel capacity than air wave broadcasting. A large number of programs can therefore be prepared and run during any given time period, including classroom periods. A further advantage, to be explored later, is the inherent capability of cable networks to accommodate transmission in both directions so that interaction between transmitter and viewer is made possible.

The major limitation of cable is that these networks usually serve only densely-populated areas with a large number of subscribers; it is seldom economical to serve rural areas with a cable network. The economies of cable operations may change dramatically in the future as satellite transmission systems are developed and refined. Satellites require less on-the-ground transmission hardware and, since they can serve an enormous geographical area, can deliver signals to populated and remote locations with almost equal facility.

The Nova Scotia Office of Communications Policy, in conjunction with the federal Department of

Communications and agencies in the other Maritime Provinces, is now examining the costs involved in extending cable to reach some 80% of the population of the province. If this extension is not found to be cost-effective it will be necessary to study the areas of the province which cannot be served economically by a cable television system in order to determine which type of video delivery system could best fulfill educational needs.

Another major limitation of cable has to do with the vaguely defined regulatory structure concerning cable television and the consequent lack of detailed policy statements concerning cable development. Thus, for example, although most cable stations can provide more than the existing 12 channels, only one channel has been set aside for educational purposes. The background to this situation is contained in the Broadcasting Act which created the Canadian Radio-Television Commission (CRTC).

This statute outlines the scope of federal jurisdiction and the objectives of Canada's broadcasting policy. The Broadcasting Act states that "broadcasting undertakings in Canada make use of radio frequencies that are public property and such undertakings constitute a single system . . ."[4] The CRTC has concluded that this statement extends its jurisdiction to include the regulation of "cable television" operations since they are "broadcasting receiving undertakings" and they form part of a single Canadian broadcasting system.

On February 17, 1975, the CRTC released a set of proposed regulations which were the subject of 8 April 1975 and June 1975 hearings. The outcome of these hearings was announced on 26 November 1975, and appropriate regulations were released. Along with the proposed regulations, the commission released several policy statements and position papers. Three of these documents may be directly relevant to this report, depending on the recently announced regulations:

- "Proposed Regulations respecting Broadcasting Receiving Undertakings"
- "Policy Statement concerning the Community Channel"
- "Policy Statement concerning the Supplementary Programming Channel"

These regulations and policy statements raise several concerns as to the future role of Cable Television in Nova Scotia. The background to these documents is provided by the 1971 **Policy Statement on Cable Television** which stated that:

> The Commission recognizes the responsibility of the cable television system licensee for the services provided through a locally programmed channel and believes that a diversity of local programming best reflects community needs and interests.

As a result of this, all cable systems in the country are required to provide locally originated programming for their subscribers. There were no specific regulations in the 1971 document to indicate how much programming must be produced by the licensee, or how large his studio must be. In general, the commission expected a larger commitment from systems which had a larger number of subscribers.

The CRTC gave three basic examples of the type of programming it had in mind in the 1971 statement. The first it called "community programming—a process which involves direct citizen participation in program planning and production." This gives the licensee a responsibility to provide **access** to its facilities for the community. The second example, which it called "local origination", involves staff production of programming about the community. The final example it called "informational programming"; this amounts to professionally produced programming of a highly specialized nature which can inform minority audiences in the community and which might not otherwise be suitable for television broadcast.

In some areas of the country the response to this policy was to program the local channel with a heavy bias towards cheap, professionally produced material such as old feature films. In response to this particular practice, the commission put out a policy statement on December 5, 1973, forbidding feature films on the local channel without special permission". At that time, however, programming produced by educational authorities was acceptable for broadcast on the community channel.

The 1975 Proposed Regulations define "community programming" to mean:

> programming originated by the licensee and produced either . . .
>
> a) by the licensee,
>
> b) by members of the community served by the licensee with the assistance of the licensee, or
>
> c) by members of the community, and includes public service announcements, program promotion announcements and channel identification announcements.

The regulations concerning the community channel specifically state that no ". . . off-air broadcast programs or re-runs of such programs will be allowed". Since Nova Scotian educational television

is broadcast over-the-air by the CBC, this appears to restrict the possible role of this cable channel in spite of later comments in the policy statement on community programming to the effect that in urban areas . . .

"The concept of community is not necessarily related to geographic areas only. There are communities of interest, for example, based on cultural background or arising out of common endeavour. The communications needs of these communities extend to such matters as the exchanging of ideas, increasing social and political awareness and dispelling the sense of isolation so prevalent in large urban centres"[8].

It appears that the concept of using educational packages, prepared either in the Department of Education or elsewhere, has been rejected by the CRTC insofar as the community programming channel is concerned. This is a matter which merits further consideration. Perhaps exemptions could be made by the commission in areas where this channel appears to provide the most efficient use of resources for transmitting educational material.

A further channel, referred to as the Supplementary Programming Channel, is the subject matter of the last 1975 Policy Statement. The concept behind this channel was based on the desire to ensure that enough flexibility was maintained so that licensees could buy broadcast programs from other broadcasters, independent producers, provincial production agencies and the National Film Board. This appears to be the concept which was originally outlined in 1971 for the Community Programming Channel and therefore merits considerable support. Unfortunately, the Policy Statement goes on to conclude that . . .

> The Commission considers that the development of the community channel must remain the first priority in order to exploit the full potential of this channel to foster community involvement. The Commission does not wish licensees to be diverted from this objective.
>
> At the same time, however, the Commission recognizes that where licensees have additional channel capacity available **after complying with the regulations relating to channel carriage on their converter service** . . . they may wish to develop a new type of service. Accordingly, the Commission is prepared to consider applications **by licensees who have a converter service** to establish a new channel to be known as the supplementary programming channel (emphasis added).

CATV systems in the Maritimes normally carry no more than 6 channels because of the limited availability of off-air signals. The remaining standard channel assignment could therefore be assigned differently in this region. It is a matter of record that no licensee in Nova Scotia has foreseen a need to apply for permission to install the converter service which would open up a new set of channels. Since the channels presently allocated to cable operators in Nova Scotia are not being used to capacity, it is unlikely that such applications for a converter service will be forthcoming in the foreseeable future. Thus, in effect, in Nova Scotia there will be no opportunity to take advantage of such a supplementary programming channel.

These restrictions appear to be unnecessary and restraining in the context of the Nova Scotia situation. More flexible channel allocation rules which recognize uniquely Nova Scotian situations are necessary to develop the potential role of cable distribution systems to enhance the social, cultural and educational environment of Nova Scotian communities.

The issues which must be resolved concern the scope of the community channel and the priorities for carriage of signals, priorities which result in the supplementary programming channel being reserved for converter service. It may be that the right of a province to request the reservation of an educational channel satisfies the educational needs as they are perceived by the commission. This arrangement is possible as a result of federal cabinet direction to the CRTC.

The federal Order-in-Council 1970-496[9] directs the CRTC to issue or renew licenses where the provincial authority has given written notice to the commission that it desires that cable transmission facilities of that undertaking be reserved for the use by the provincial authority for the purpose of broadcasting. This applies **only** if the CRTC "stipulates that at least one channel of the undertaking be reserved for the use of the provincial authority for that purpose." The broadcasting may be of the following broadly educational types only:

> programming designed to be presented in such a context as to provide a continuity of learning opportunity aimed at the acquisition or improvement of knowledge or the enlargement of understanding of members of the audience to whom such programming is directed and under circumstances such that the acquisition or improvement of such understanding is subject to supervision or assessment by the provincial authority by any appropriate means.
>
> programming providing information on the

available courses of instruction or involving the broadcasting of special education events within the educational system.

This rule, in effect, permits a province to pre-empt at least one channel for educational television. There are two circumstances in which the rule is applicable: where the province wants a cable distribution system to carry the programs of its own educational television station which already has a broadcasting license; and where the province has no license but wants to use the cable distribution system in a particular community for distributing its educational programming.

In fact, however, the rule has almost never been necessary. In almost all examples of the first circumstance, notably with the programming of the Ontario Educational Communications Authority, the licensee was required to carry the educational channel through the operation of another rule which makes carrying local Canadian stations mandatory.

The second circumstance has almost never arisen because provincial authorities have preferred to negotiate an arrangement with the CBC to carry educational programming during morning school hours instead of requesting any cable distribution systems to carry it. This is the system which Nova Scotia has been using since 1962 with television, and even longer with radio.

Nevertheless, the rule seems reasonably clear: a channel is available for use if the programming fits the educational description. It does not matter whether the provincial authority has its own broadcast license or not. There are no stipulations in the rule requiring a certain minimum amount of programming prior to pre-empting the channel. Nor is there any necessity to make the pre-emption with any province-wide uniformity or standards. So long as there is "the present intention of using such facilities within a reasonable period of time," the rule can be used.

In conclusion, the Department of Education is assured of access to one channel in accordance with the Order-in-Council. Nevertheless, it is quite likely that the CRTC restrictions on access to other channels will inhibit the growth of cable in the field of education. This is a matter which should be discussed with the CRTC and cable operators.

.3.1 Cable Distribution Systems in Nova Scotia

By 1973, the Canadian Radio Television Commission had licensed six CATV undertakings which are now serving the communities of Amherst, Bible Hill, Dartmouth, Halifax, New Glasgow, Pictou, Stellarton, Trenton, Truro and Westville. On August 3, 1973, the commission issued broadcasting licenses to a number of new applicants to service the communities listed in the table below. It is noteworthy that these systems have organized a cable network, making Nova Scotia unique in Canada. Assuming a reasonable penetration rate in the future, a large proportion of the population will soon have access to a cable television.

A survey of cable systems[10] already operational indicates that even though the operators of these systems show a definite interest in collaborating with local school boards, only a few schools and universities are presently making use of the cable facilities. Most cable operators would connect the schools in the areas they cover if asked to do so.

The survey also indicates that some cable operators would be willing to train teachers and students in the use of video equipment. Portable video equipment and studio facilities of most cable systems surveyed would be accessible to educational authorities under the same arrangement. Only a few schools have working arrangements with the cable operators at the moment. The present limited use of this potentially useful medium is due to several factors, notably lack of funds to attempt innovative ideas and perhaps a lack of information concerning the possibilities in what is basically a new, and expensive, technology.

Most cable systems in Nova Scotia have the potential of operating with 12 channels or more (with minor modifications noted previously). Some systems could conceivably be converted into two-way systems, which have numerous advantages. A bi-directional system enables such things as program origination and program selection from the receiving set, programmed instruction, and many other innovative applications in interactive viewing. Bi-directional systems, as a normal service offering, still seem ten to twenty years distant, however.

One of the most sophisticated broadband (*i.e.* high capacity) networks which uses cable technology is currently in operation in Halifax. It provides bi-directional video and audio links for medical education between a number of locations in the downtown core of Halifax.

Innovative CATV programming has been attempted by several cable systems. Other cable operators have shown some interest in the educational area. The ETPNS studies have identified several

Table 2-2. Cable Stations in Nova Scotia

Licensee	Community Served	Population of Community[1] (1971 Census)[2]	Population Including Surrounding Area
Central Cable T.V. Ltd.	Amherst	9,996	15,139
Metrovision Ltd.	Bedford-Sackville	7,530	26,360
Dartmouth Cable T.V. Ltd.	Dartmouth	64,770 (17,115 Households)	75,445
John S. Macalpine OBCI	Digby	2,363	16,509
Halifax Cablevision	Halifax	122,035	213,654
Kings Kable Ltd.	Kentville, New Minas, Wolfville, Pt. Williams, Aldershot, Greenwich, Gaspereau, Berwick, Aylesford	9,465	24,667
Leon Gordon Fiske, OBCI (Mid-Valley Cablevision Ltd.)	Kingston, Greenwood, Middleton	7,257	to include Bridgetown and Annapolis Royal 19,275
Able Cablevision Ltd.	Liverpool, Brooklyn, Milton	3,654	9,296
Seaview Cablevision Ltd.	Lockeport, Shelburne	3,897	8,658
Tri-Town Cable Ltd.	Lunenburg, Bridgewater, Blockhouse, Mahone Bay	9,779	Lunenburg County Pop. 38,422 concentrated in SW
K-Vision Services Ltd.	New Glasgow, Stellarton, Trenton, Pictou, Westville	27,685	county population of 46,104
Found, R. W. Lt. Col. Commanding Officer	Sherose Park, Barrington	400	
John Louis Bragg, OBCI	Springhill	5,262	11,506
Arno Garby Hawboldt OBCI	St. Croix, Windsor, Hantsport	5,775	8,004
Eastern Cablevision Ltd.	Truro, Bible Hill	13,047	to Stewiacke
Coratel Services Ltd.	Truro-Colchester Hospital	200	22,449
Gordon Griffiths Price OBCI (Yarcom Cable T.V.)	Yarmouth	8,516	Yarmouth County Concentrated on West Shore Population 24,682
Archibald, Percy A. OCBI	Antigonish & Area	5,489	Antigonish County Small and scattered pop. 16,814
Khattar, George, OCBI	Glace Bay, New Waterford, Dominion	34,916	Starts to overlap with Cape Breton Cablevision
Shannon, Joseph OCBI	Port Hawkesbury, Mulgrave, Point Tupper, Port Hastings	5,668	to St. Peter's including Isle Madame 15,467
Cape Breton Cablevision Ltd.	Sydney, North Sydney, Sydney Mines, Florence, Sydney River	51,825	

[1]In a grouping towns that are underlined comprise the population figure in column 3.
[2]License boundary is as approved by the CRTC and includes at a minimum the area defined by recognized municipal boundaries.

problems associated with present approaches however, notably the difficulty of forging new relationships between the cable operators and the Department of Education. This will be a key area in future efforts to extend the educational use of CATV in the province.

.4 Radio Broadcasting

The Nova Scotia Department of Education has cooperated with the CBC and with other Departments of Education in the Atlantic provinces in school radio broadcast production since 1928. Improvements are planned to extend the coverage provided by the CBC English radio network. The French network, which is also being upgraded, cannot reach major population centres at the moment. As with CBC French television, French radio will be broadcast from Moncton, New Brunswick, where the CBC has its only maritime French radio and television production facilities.

There are currently over 800 educational radio stations in North America, most of them using the FM band. About 75% of these stations are licensed to colleges or universities, with the remainder divided among public schools, libraries and municipalities. Because of the low-power transmitters which many of these FM stations use, the broadcast radius of these stations is often limited to from two to five miles.

There are 33 AM radio stations and 5 FM stations in Nova Scotia. Radio broadcasting is scarcely used in Nova Scotia's schools. The **Survey of Educational Equipment and Materials**[1] indicated that 526 schools, with an enrollment of 180,000, have only 370 receivers (most of which are only AM). There is therefore only one radio receiver per 486 students on the average. Moreover, some schools had no radio receiver whatsoever. Comments made by school principals show that the quality of reception in many locations is not satisfactory.

.5 Common Carrier Communications

The province is served by both Maritime Telegraph and Telephone Company (MT&T) and Canadian National-Canadian Pacific (CN-CP). The

Figure 2-2. AM Radio Stations in Nova Scotia

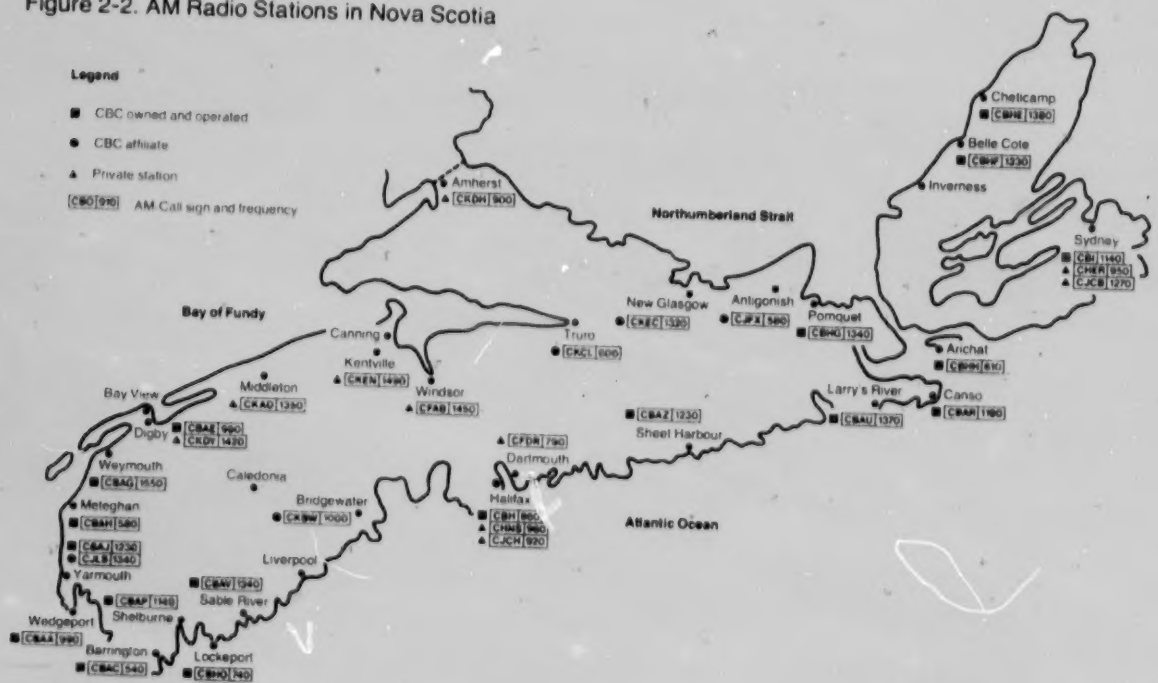
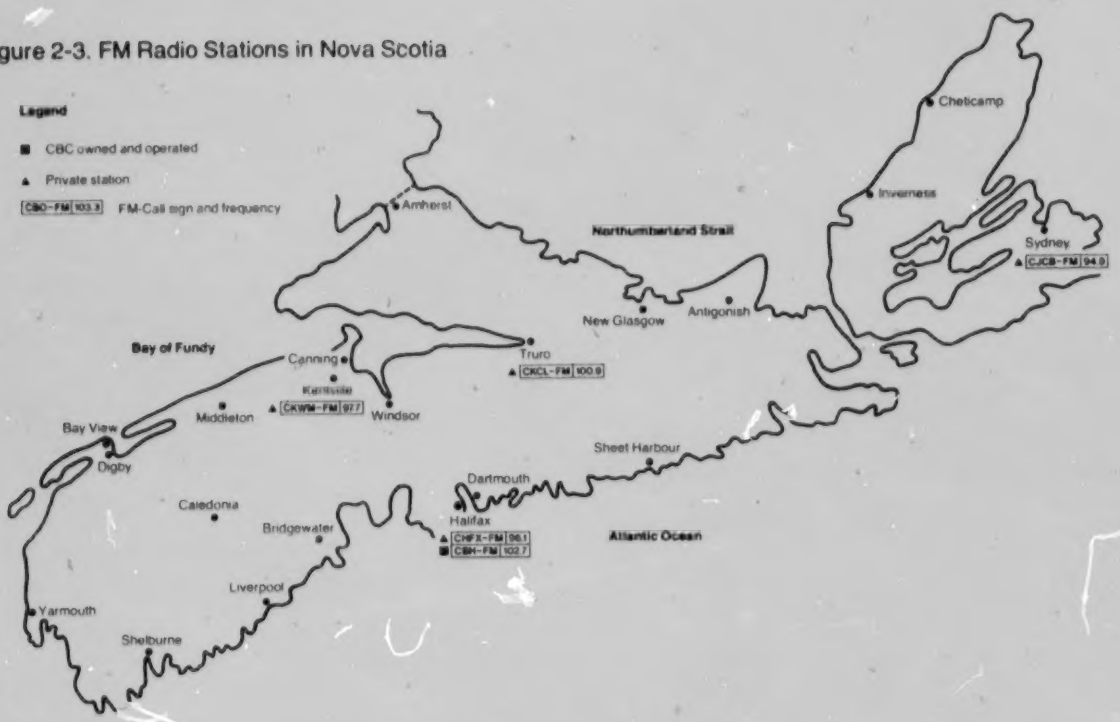


Figure 2-3. FM Radio Stations in Nova Scotia



combined services are listed below (those services with an asterisk are provided by MT&T only):

- Direct Distance Telephone*
- Low and Medium Speed Data Service
- Broadband Data Transmission
- Wideband Data Transmission
- Electrowriter
- Facsimile
- Telex/TWX
- Video and Audio Transmission
- Slow Scan Television
- High Fidelity Audio*
- Private Line Service
- Hotline Telephone Service

These communications services can be separated into two categories:

a) non-data services;

b) data services.

In the first category are included services ranging from voice transmission over the telephone network to television transmission over the microwave network. Some services, such as television transmission, are obviously not available everywhere in the province because they require highly sophisticated telecommunications facilities. Other services, such as the transmission of writing from one location to another (Electrowriting, known as Telescript by MT&T and Flexowriter by CN-CP) and Slow-Scan Television, while available wherever there is a telephone service, require expensive terminal equipment at both ends.

In the second category is included a wide range of services used in computer communications which are referred to as data services. These can be divided into low, medium and high speed ranges, according to the speed and volume of data sent. Some of these services, in particular the high speed data services, can be offered only in certain locations of the province because of the requirement for high capacity transmission lines.

In spite of the high costs of these computer communications services, the demand for them is rising rapidly in Nova Scotia. This may require a more extensive telecommunications network infrastructure. This would be well within the capabilities of both MT&T and CN-CP. Both companies expect to extend their digital data networks (Dataroute and Infodat) from Halifax to Sydney in the near future.

More sophisticated data networks using packet switching technology (called Infoswitch by CN-CP and Datapac by MT&T) are also becoming available. For example, the Datapac service is designed to

become a Canadian network for data communications and will be operational in mid-1976, with four network centres (Calgary, Toronto, Ottawa and Montreal); by 1980 there will be at least 14 centres, including Halifax.

One of the biggest advantages of a packet switching network is that rates are based primarily on the volume of data sent, with distance as a secondary factor. This means that access to large data bases or computers providing special services, located outside the province, becomes economically attractive until such time as the provincial demand and sophistication of applications reach a level at which local facilities can become competitive.

.6 Computer Applications

During the past decade, computers have become an integral part of everyday life. They are now used for almost every business activity imaginable, from basic record keeping to complex market analysis. Computers are also used extensively to control industrial processes and sophisticated transportation systems.

Only recently though have computers been introduced to education with the same determination as their introduction to business and industry. At first, the introduction of computers in education was limited to research and housekeeping roles. This has had several effects: computer use affected research and development in terms of the size of the samples used, the scope of statistical treatment, the complexity of analysis and comprehensiveness of approach. Administration has benefited in accounting and payroll procedures, allocation of materials and resources, purchasing and, to a lesser degree, in the scheduling of buses, students and classes, and in maintaining records and producing reports.

Most universities in Nova Scotia have in-house computer systems for research, administrative and instructional applications. Table 2-3 lists the computers which are used for High School educational applications.

There is a growing range of services available for the schools. For example, computer time may be rented from various sources both within and outside the province, depending on the applications sought and the relative economies between computer power and communications line costs. Several manufacturers are also offering low-cost miniaturized computer systems which may be installed in the schools for a fraction of the price of larger systems but which nevertheless provide a wide range of educational applications.

Potential new applications are now opening up in education. Recently, computers have been applied to a broader range of information processing functions such as information retrieval of book titles in libraries. Most recently, computers have begun to be applied to instruction in schools.

Many see computer assisted learning (CAL) as offering new opportunities for improving education through individualized learning, immediate learning feedback and high degrees of learner participation. Another potential exists in the area of job training, retraining and job upgrading, including both pre-job and on-the-job training.

In order to assess the extent of computer use in the school system, a survey was undertaken of administrative and instructional uses of computers in Nova Scotian schools[12]. The survey complements the activity of another study on the use of computer resources among Atlantic universities and other post-secondary institutions, entitled **Program for the Sharing of Computer Resources in the Atlantic Universities**[13].

.6.1 Administrative Applications

There are currently two major administrative applications of computers in the Nova Scotia school system: the Teacher Information File maintained by the Department of Education, and the scheduling and report card services used by 17 high schools in the province. The Teacher Information File involves using the Provincial Government's computer in order to maintain computer files on Nova Scotia teachers. A Teacher Master File is now operational, and includes teacher information such as name, certification, qualifications, experience, current assignment and previous year assignment. Files for about 11,000 active teachers, of the 30,000 certified teachers in Nova Scotia, are maintained in this system.

A Teacher Service History File, which is not yet active, will contain a detailed record of each teacher's service in the public schools of the province. Such information would be extremely valuable for locating Nova Scotian resource personnel in the future. Plans exist which would allow this computer file to be expanded to include information on such items as facilities, space, and programs offered, as well as pupil information and financial information.

Seventeen high schools in the province used outside services in Montreal for classroom scheduling and report card preparation last year. Some schools

Table 2-3. Educational Computers in Nova Scotia High Schools
(A = Administrative Usage, I = Instructional Usage)

Source	Type of Computer/Location	Current Educational Usage
Provincial Government	IBM 370/145 Halifax	A: Teacher Information System (11,000 teachers)
		I: Pilot APL Instructional Project with 4 High Schools in the Halifax area.
Coast Guard College	HP 2000E North Sydney	I: Instructional Project with 2 Sydney High Schools using BASIC.
Pugwash District High School	HP 9830A Pugwash	I: Instructional Project using BASIC.
Dalhousie University	CDC 6400 Halifax, RJE at Nova Scotia Tech., RJE at Acadia	A: Typical University Administrative Use. I: Mainly R&D Projects. Two Halifax High Schools have limited access to the facility, by an informal agreement.
St. Peter's District High	COMSPACE CT 650 Richmond County	I: Simple Computer System for Business and Math students.
Mount Allison University, N.B.	IBM 1130 Sackville, N.B.	I: Run Programs developed by students in a Grade 12 Course at Amherst Reg. High.
St. Francis Xavier University	HP 3000A Antigonish	I: Run Programs developed by Grade 12 students at Antigonish Regional High.
COGITO Ltd.	IBM 370/155 Montreal	A: Scheduling, Report-Carding for 11 N.S. High Schools.
SMA Ltd.	CDC 6600 Montreal	A: Scheduling for 5 N.S. High Schools.

have been on this system for 5 years. A listing is produced by the system, which can be used to construct schedules by hand, or a more complete listing provides a set of teacher, room, and individual student timetables. A report card service which provides student report cards complete with honour and failure lists is also offered.

The current annual costs for these services, on a per student basis, are approximately $2.60 for report cards and $3.00 for scheduling. There are plans for at least one school to extend the report card feature to become a historical data base, with the capability of producing high-school transcripts for post-secondary use.

These administrative services have proved very valuable, particularly since scheduling reduces the teacher workload, reduces clerical staff, and improves schedules. Both scheduling and report card preparation are becoming more routine and efficiently implemented; in this way a system can be developed which is more receptive to individual needs than a manual system consisting of equivalent effort. Administrative staff indicate that, in terms of cost alone, these services are warranted for larger schools of over 350 students.

Beyond these services, however, administrative applications of computers in the Nova Scotia school system are limited or non-existent. As the need to improve school procedures and school board practices, as well as Department of Education financial administration and reporting systems, becomes more evident, it is likely that computers will be

looked at more closely. This need will probably become more apparent as the cost effectiveness of computers in these areas improves.

.6.2 Student Applications

A number of student uses of computers are also currently under way in the province. Of particular interest is a pilot project using APL (A Programming Language), which began in the fall of 1972. APL terminals have been installed in four high schools in the Halifax area and have access to the Provincial Government's computer for up to six hours per day. The terminals are used by students to develop expertise in algorithm development. Statistics packages and some short CAL packages currently exist on the system, but students and teachers generally develop their own programs for these applications. This programming effort could be improved if more standard programming packages were accessible to students and teachers.

Following a preliminary assessment of this project by the Department of Education, costing advice was provided describing network configurations which would include more terminals in the Halifax-Dartmouth area, and extend this APL usage to high schools in Sydney. The study documented the costs and some of the broader concerns of introducing computers into the instructional process. Such concerns as which languages are suitable and available, what computers might be used in Nova Scotia, the level of typical line costs, alternative configurations, the possible use of other terminals, and so on, were examined in detail by this study.

The study concluded that more experiments must take place, possibly in other computer languages such as BASIC. There is, for example, a much more extensive range of materials available for secondary schools in BASIC than in the APL language. Teachers should also be better informed as to the advantages and disadvantages of computers. Trained resource people must also be made available to assist teachers and administrators in using computers for educational purposes.

Current applications of computers at the high school level are summarized in Table 2-4. Only two schools offer a course for credit (at the Grade 12 level) which involves using computers. In these classes students are taught about computers and gain experience by using computer terminals which are connected to a local computer facility. Seven other schools are experimenting with student use of computer terminals after class. Two others have informal arrangements for students to use a university computer after class, using cards for programming. One school offers a limited experimental facility for student use. Most of the students and teachers involved use computers for applications related to mathematics or science based courses, with students writing relatively simple programs related to their course work after receiving some preliminary programming instruction.

There is a high level of acceptance of computer use among students and teachers directly exposed to it. However, many students cannot get adequate time at a terminal, and if the computer breaks down, they are rarely able to get access within a week because of scheduling difficulties at the terminals. Teachers therefore suggest a minimal ratio of about 50 students per terminal for access to the computer. A further problem is that most teachers rarely have time to develop any material on the terminal because of directing after hours classes for students. Some teachers recognize the potential of readily-available commercial software but are not aware of how to obtain any, or how to evaluate its relevance and effectiveness.

It therefore seems reasonable that if the Department of Education and school administrators wish to expand the introduction of computers, they should seriously consider the problems associated with software acquisition and evaluation. Teacher release time to develop greater expertise, the terminal/student ratio, and training requirements for teachers and students require further examination.

.7 Equipment Resources

One of the early requirements of the ETPNS study was to gain more information about the type and quantity of equipment and software materials available for use by teachers. In order to provide this information, a **Survey of Equipment and Materials**[14] was developed. The following objectives of this survey were set.

To determine the quantity and distribution of equipment and software resources available in Nova Scotia's elementary and secondary schools.

To estimate the corresponding current dollar investment in this equipment and software.

To determine usage and state of repair of the equipment.

Table 2-4. Educational Use of Computers in Nova Scotia High Schools

Board	School	Computer/Terminal/Location	Type of Use
Halifax City	Queen Elizabeth High School	IBM 2741 Terminal (1) in school Prov. Gov't. IBM 370/145 computer in Halifax.	Pilot Project. Students are given a short course in APL, and then write programs on the terminal related to math and science subjects. The use is not part of the curriculum. Students work during spares or after classes.
	J. L. Ilsley	IBM 2741 Terminal (1) in school Prov. Gov't. IBM 370/145 computer in Halifax.	Pilot Project. Same operation as for Queen Elizabeth High School, described above.
	St. Patrick's High School and Halifax West High School	Liaison with Dalhousie CDC 6400 computer.	Students work after hours and on Saturdays. Programs are usually written in FORTRAN, keypunched at Dalhousie by the students, and run in a batch mode. An informal arrangement with the Computing Centre Director at Dalhousie permits this limited activity.
Cumberland County	Pugwash District High School	Desk Top HP 9830 (mini computer)	Pilot Project. A short course in BASIC is given to students, and the terminal is used for algorithmic work related to math topics performed outside the regular curriculum.
	Amherst Regional High School	IBM 1130 at Mount Allison University, in Sackville, New Brunswick.	A credit course on computers is offered to Grade 12 students. Approximately 45 math students take this course with their programs being executed on a computer at Mount Allison University. Programs are generally mailed to Mount Allison and "printouts" returned to Amherst.
Cape Breton County	Riverview High School	1 Teletype Terminal in the school accessing Coast Guard College HP 2000E computer in Sydney.	Pilot Project. Students are given a short course in BASIC and then use the terminal for on-line program development.
	Holy Angels High School	1 Teletype Terminal in the school accessing Coast Guard College HP 2000E computer in Sydney.	Pilot Project. Same operation as with Riverview High School, described above.
City of Dartmouth	Dartmouth High School	IBM 2741 Terminal (1) in school Prov. Gov't. IBM 370/145 computer in Halifax.	Pilot Project. Same operation as for Queen Elizabeth High School, described above.
Halifax County	Sir John A. MacDonald	IBM 2741 Terminal (1) in school Prov. Gov't. IBM 370/145 computer in Halifax.	Pilot Project. Same operation as for Queen Elizabeth High School, described above.
Antigonish County	Antigonish Regional High School	St. Francis Xavier Computer HP 3000A	A credit course in computer science for Grade 12 math students. Some Grade 11 students are taking the course. The theory is given at the school, and the students spend 1 day a week at St. Xavier running programs.
Richmond County	St. Peter's District High School	COMSPACE CT650	A special "training machine" consisting of switches, dials, and lights that allows the student to learn some of the fundamentals of data processing. Used in an elective course to Business Education and math students from Grades 11 and 12.

To provide a rudimentary inventory of equipment holdings detailed by manufacturer and model.

To determine the availability of various environmental facilities.

To provide information on usage of radio, television and computer facilities.

The survey was developed under the aegis of the Government Studies Program of Dalhousie University and was designed and conducted through federal and provincial participation and the Atlantic Institute Of Education. The survey was extensively pre-tested in the spring of 1974 and was administered by two methods: by interviews in June, 1974; and as a mail-out questionnaire in October, 1974.

Of the total of 621 schools surveyed, questionnaires were received by the closing date of November 15th, 1974 from 526 schools (85%). The schools which responded accounted for 87% of the public school enrolment for 1974. All large school boards were represented, and only two boards with one school each were not represented at all.

.7.1 Survey Findings

Equipment was reported by type, manufacturer, model number, and the number of units. There were 117 types of equipment; these were later combined into 34 larger equipment groups to facilitate the analysis. An example of an equipment group is "projectors", which includes 17 types of equipment (silent film strip projector, 8mm loop projector, *etc.*). Respondents reported 14,500 units of equipment. The largest single group of equipment was projectors, which comprised 21% of the total, with overhead projectors accounting for one third of all projectors reported.

Table 2-5. Ten Largest Equipment Groups

Equipment Group	Number (% of Total)
Projectors	3,059 (21.1)
Tape recorders	2,041 (14.1)
Record players	1,764 (12.2)
Head sets	1,322 (9.1)
Screens	1,139 (7.9)
Duplicators	979 (6.7)
Television monitors	955 (6.7)
Listening stations	473 (3.3)
Radio receivers	372 (2.6)
Photocopiers	240 (1.7)
Total	12,344 (85.1)

Cabinets, carrels, and projector carts account for 8% of the equipment. Several other types of equipment are virtually non-existent. For example, cameras (which offer a potential source of software for projectors) account for less than 1% of the total.

The equipment in Nova Scotia's schools is evenly distributed by regions across the province, as indicated by Figure 2-1. Equipment is also distributed reasonably among school boards regardless of size. In particular, the percentage of equipment in the ten largest and in the ten smallest school boards is roughly proportional to their enrollment.

The distribution of equipment among schools indicates that some groups of equipment are fairly widely distributed, while others are concentrated among fewer schools. Table 2-6 shows the distribution of several groups of equipment among the 526 responding schools, expressed in terms of the number of schools which have at least one item of the group specified.

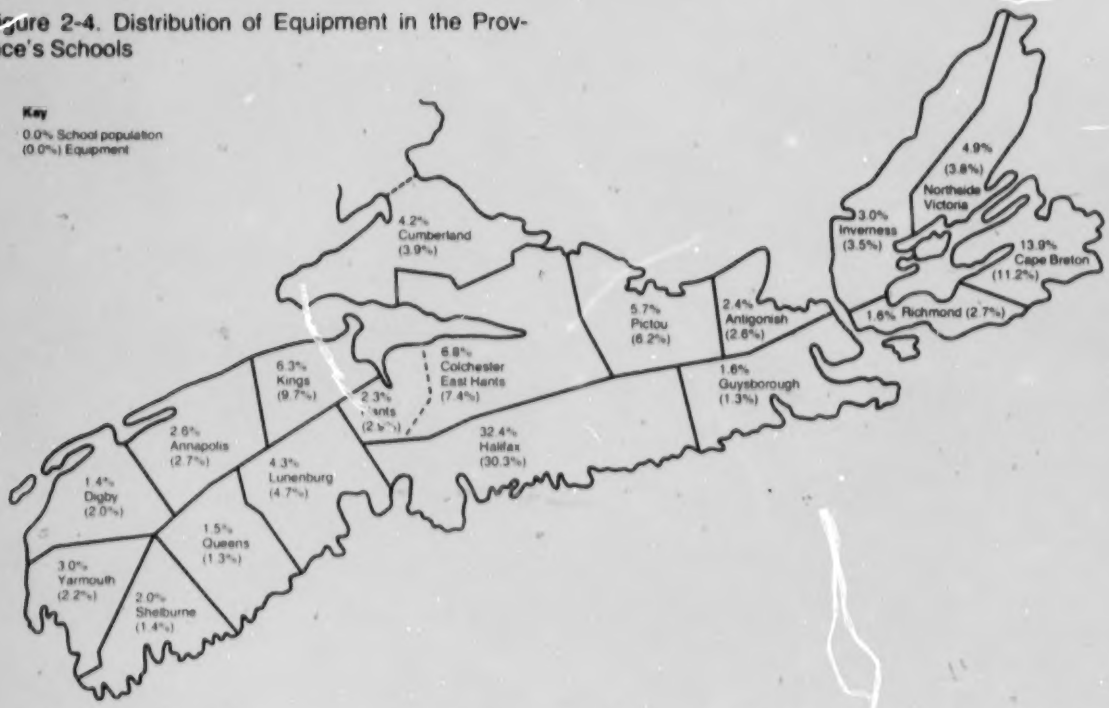
Table 2-6. Equipment Holdings in Nova Scotia Schools

Equipment Group	No. of Units	No. of Schools
Cameras	70	42
Duplicators	979	453
Photocopiers	240	184
Projectors	2059	489
Radio Sets	372	203
Record Players	1764	468
Screens	1139	354
Tape Recorders	2041	464
Television Sets	955	449

Further analysis indicates that this equipment is not always present in the right combination. Combinations of equipment are necessary for multimedia types of production and for simple processes such as using a slide projector to view the results of slides taken on the school camera.

Of the 526 responding schools, 52% reported that they had at least one of the following types of equipment: record player, duplicator (gestetner-type), or overhead or filmstrip projectors. However, only 40% of the respondents could have added such items as a 16mm projector or a cassette tape recorder to complement these equipment holdings. Only 22% of the schools could have supplemented this larger combination of equipment types with a photocopier/thermal duplicator. Finally, only 5%

Figure 2-4. Distribution of Equipment in the Province's Schools



had all these equipment types in combination with a 35mm projector.

Clearly, such combinations of equipment are necessary if one is to shift with ease from one medium to another and to let different media complement one another in the normal flow of a classroom session. Yet, as noted above, even basic combinations of equipment are missing in over 50% of Nova Scotian schools (on the basis of those who replied).

Tables 2-5 to 2-7 indicate the amount of equipment available in schools in Nova Scotia. Ratios of equipment to school population, given in Table 2-8, show that equipment in Nova Scotia is spread more thinly among its students than is the case for Canada as a whole[13].

Table 2-7. Ten Largest Equipment Types

Equipment type	Number	(% of Total)
Monaural record player	1309	(9.0)
Cassette tape recorder	1067	(7.4)
Overhead projector	1018	(7.0)
Filmstrip projector	967	(6.7)
Television receiver(b/w)	816	(5.6)
Reel-to-reel tape recorder	785	(5.4)
Portable screen	686	(4.7)
16mm projector	625	(4.3)
Spirit duplicator	608	(4.2)
Stereo record player	454	(3.1)
Total	8335	(57.5)

Table 2-8. Rough Comparison of Ratios of Equipment to School Population Between Nova Scotia and Canada

Equipment	Nova Scotia	Canada
Record player	1:92	1:72
Overhead projector	1:177	1:93
Reel-to-reel tape recorder	1:229	1:111
Silent filmstrip projector	1:186	1:122
Cassette tape recorder	1:168	1:133
Small filmstrip viewer	1:1,600	1:133
35mm slide projector	1:1,200	1:196
16mm projector	1:288	1:212
TV receiver monitor	1:205	1:217
Listening stations	1:390	1:244
Opaque projector	1:1,500	1:555
8mm loop projector	1:1,500	1:500
Video recorder	1:13,800	1:827
TV camera	1:5,800	1:3,125
Microfilm reader	1:22,500	1:12,500

Table 2-9. State of Repair for the Ten Largest Equipment Types

Type of Equipment	Good*	Usable*	Unusable*
Monaural record player	59	25	12
Cassette tape recorder	80	14	2
Overhead projector	80	12	2
Filmstrip projector	71	18	5
Television receiver(b/w)	56	33	7
Reel-to-reel tape recorder	70	21	5
Portable screen	71	19	5
16mm projector	61	28	6
Spirit duplicator	55	32	8
Stereo record players	68	22	6

* All numbers in percentages

.7.2 State of Repair of Equipment

Respondents indicated that 70% of the equipment was considered to be in an excellent state of repair. States of repair reported for the ten most common types of equipment (listed in Table 2-7) are shown in Table 2-9.

Table 2-9 shows that some equipment is generally in poorer condition than other types; this is possibly related to the age and utilization of the equipment. A full inventory or an update of existing files would provide more detailed information, which might enable correlations to be made between such factors as purchasing procedures, repair and maintenance facilities, and replacement policy.

The survey also found that when equipment breaks down, it is generally inoperable for a day or so; less than 10% is out of use for more than a week. Yet schools do find it very difficult to have equipment repaired. While there are two excellent technicians at Audio-Visual Services in Halifax, it is very difficult for them to keep up with the workload.

Qualified local repair services are both costly and limited to a given range of equipment; consequently, schools must contend with increased time out of service because equipment has to be shipped to Halifax. These difficulties must be overcome if educators are to fully utilize the audio-visual equipment already at their disposal.

.7.3 Equipment Utilization, Acquisition and Value

Most equipment is used for several hours a week with about 25% of the equipment being used more frequently. The majority of teachers appear to use most of the equipment; however, 33% of responses indicated that some equipment is used by only a few teachers. As shown in Table 2-10, the main reason

for lack of use was that equipment was not available when needed. Responses regarding use of radio and television indicated that poor signal reception and scheduling difficulties were the main reasons for not using these media more frequently.

Large amounts of time and money are spent by manufacturers advertising to stimulate the educational market yet, in general, manufacturers find it difficult to sell to this market since it is so fragmented and no single group represents all buyers. At the same time, schools have very little money to spend. Consequently, purchasing of equipment and materials frequently depends upon the ability of the teachers, students, and parents groups to organize fund raising projects. Because of this, equipment availability can often be linked to the superior sales ability of students, and number of students, as opposed to need. Obviously, small schools suffer with this sort of arrangement.

In the past, those persons responsible for purchasing equipment have relied upon their own judgement or that of colleagues; very little information is available to them to assist in making a choice. Too often after purchasing an item, they find that their choice could have been better. In all schools it is usually a senior administrator who chooses the audio-visual software and equipment for purchase, although teachers may sometimes be consulted as to choice. The final approval of the purchase order generally rests with the school board.

At present, school boards submit details of proposed audio-visual purchases to the Department of Education for approval of cost sharing under the Foundation Program. Requests received by the department for audio-visual equipment and software are then assessed to ensure the requests are reasonable, based on the estimated cost. Once it has been cleared, the cost of equipment is approved for sharing.

The amount to be shared is based on a formula which takes into account the school size and the percentage of provincial contribution for the municipal district concerned. There is an upper limit for cost sharing of equipment and software. This limit, which is determined by the Provincial Treasury Board, can vary from year to year, but is presently $250,000. Should the amount requested and approved exceed this limit, then the provincial contribution is allocated on a proportional basis.

Should a request not be approved by the department (and such refusal would be primarily on cost grounds), the school board can decide to undertake

Table 2-10. Reasons Equipment Not Used

Equipment	Equipment Not Available %	Course Material Not Available %	Difficulties With Equipment %	Other %	Used Frequently %	No Response %
Silent filmstrip projectors	9	14	4	4	50	18
Opaque projectors	8	13	15	17	29	18
Overhead projectors	9	12	2	7	52	17
Slide projectors	9	26	2	8	33	22
16 mm projectors	11	13	3	6	49	15
Radios	5	5	6	24	37	22
Record players	5	6	5	0	60	19
Small cassette tape recorders	7	10	3	4	59	16
Reel to reel tape recorders	9	12	7	13	41	19
TV receivers	9	5	5	8	50	23

purchases with its own funds. In any event, school boards must finance the difference between the purchase cost and the provincial contribution. For some boards this represents a major portion of the cost.

Title to equipment purchased according to the procedure described above is vested in the school board. Though much of the equipment so purchased is normally issued to a school, it is credited to the school's budget if the school budget procedure is followed, and is not normally lent or transferred to another school. In addition, certain equipment is often purchased outside the formal organizational procedure (by parents' groups, and so forth) for a particular school, and is considered to "belong" to that school.

Some equipment can also be obtained for a school by a school board under French language instruction grants from the Federal Secretary of State Department. It may be possible for equipment to be obtained under the TEPDS Program through projects whereby teachers can request approval for funds directly from the Department of Education for the development of new courses and curriculum. Similarly, funds may be obtained from the Program Development Assistance Fund administered by the Nova Scotia Teachers Union.

School boards will sometimes purchase equipment which is lent to schools upon request, but which is normally kept in a central store. Videotape recorder/players fall into this category at the moment because of their relative expense and infrequent use in most schools. It might be surmised that at least some types of equipment falling into this category would, in time, be issued to schools as their utilization increases.

To calculate the current dollar investment in equipment in Nova Scotia's schools, minimum, average, and maximum prices for a new unit of each type of equipment were estimated from catalogues and manufacturers' educational price lists. These prices, listed in Table 2-11, do not account for inflation, local market conditions, and quantity discounts. The prices, multiplied by the quantity of each type of equipment reported in the survey, provide the following range of estimates on the basis of current prices:

- Value at minimum price estimate—$2.3 million
- Value at average price estimate—$3.5 million
- Value at maximum price estimate—$6.4 million

These amounts estimate the current cost of replacing the equipment presently in inventory as recorded in the survey. Therefore, replacement costs would lie between $2 million and $6 million, depending on the quality of the equipment.

.8 Conclusions on Foundation

The impression emerging from the previous discussion indicates that the major elements for the basic use of educational technology in the province are present, although the numbers and distribution of these elements may be less than adequate. Even though equipment appears to be evenly distributed by regions, by school boards, and by school population, certain types of equipment are available only in limited quantities in the province. For example, few schools are equipped with projection or room-darkening facilities. Another finding revealed that equipment is spread more thinly among Nova Scotia students than is the case for Canada as a whole.

The analysis points to specific problems requiring special attention, as follows:

lack of proper training for teachers;

lack of software and materials;

lack of proper maintenance and repair facilities;

lack of environmental facilities (black-out curtains, screens, *etc.*);

a fragmented purchasing policy and lack of guidance available to school boards in the buying of proper equipment.

Before any attempts at augmenting the existing stock of equipment are made, it would be wise to try to correct these deficiencies. This subject is treated in further detail in the next section. In Chapter 56 of the report of the **Royal Commission on Education, Public Services and Provincial-Municipal Relations** [16], a dollar figure is given as to the amount of money that should be made available to schools for the purchase of equipment ($6.00 per student for common schools, $8.00 per student in high schools). Based on enrollment figures for public schools for 1973-74, this allotment would approach $1.3 million per annum. If this money indeed became available, then perhaps it might be spent initially in ways which would alleviate the problems which exist now. Some schools have a great need for equipment. These schools therefore require a considerable expenditure of capital to come up to some basic standard of equipment and facilities.

The survey findings generated inputs to other

Table 2-11. Estimated Current Dollar Value of Equipment

Equipment Type	Cost per unit ($)			Inventory	Average Total Value ($)
	Minimum	Average	Maximum		
Cabinet, filing/storage	100	200	350	582	116,400
Camera, 35 mm	50	100	200	22	2,200
Camera, cartridge	30	70	100	24	1,680
Camera, polaroid	40	60	175	14	840
Camera, super 8 mm	50	100	200	6	600
Camera, video portapak	1,700	2,000	2,500	6	12,000
Cart, projection	30	50	100	250	12,500
Copy kit, small	30	40	70	2	80
Darkroom	500	700	1,000	41	28,700
Duplicator, gestetner	400	500	800	368	184,000
Duplicator, spirit master	250	300	400	608	182,400
Duplicator, thermal	250	300	400	200[1]	60,000
Film editor/splicer	7	10	20	32	320
Head sets	80	100	150	1,322	132,200
Listening station	30	60	80	461	27,660
Microfilm reader/print	1,500	2,000	3,000	8	16,000
P.A. (two way)	1,000	1,500	2,500	188	282,000
Photocopier	5,000	7,500	10,000	40[1]	300,000
Proj. film strip, silent	30	60	200	967	58,020
Proj. microscope	120	150	250	24	3,600
Proj. opaque	150	400	700	120	48,000
Proj. overhead	140	200	600	1,018	203,600
Proj. slide 35 mm	100	180	500	149	26,820
Proj. 8 mm loop silent	100	180	500	35	6,300
Proj. 8 mm silent	50	100	200	14	1,400
Proj. 16 mm, sound	500	600	1,000	625	375,000
Radio AM/FM	40	100	150	370	37,000
Reader, controlled	50	150	250	7	1,050
Record player	50	80	130	1,764	141,120
Screen, fixed	50	100	500	227	22,700
Screen, portable	40	60	100	686	41,160
Screen portable, rear	80	150	250	74	11,100
Tachistoscope	10	15	20	31	465
Tape recorder, cassette	40	90	150	1,246	112,140
Tape recorder (reel-to-reel)	150	450	800	785	353,250
Television sets 23" approx.	500	800	1600	898[2]	718,400
Video recorder-player	1,100	1,500	1600	8[3]	12,000
Viewer, film strip	20	30	40	5	150
				Total	**3,532,856**

[1]Estimate.

[2]Includes monochrome and color, monitors and receivers.

[3]Includes 1 play only cassette, 3 reel-to-reel, and 4 recorder-players.

projects in the ETPNS study. Further use may be made of survey results in order to improve equipment utilization. However, many people involved in the survey noted that the information gathered would become outdated unless periodic survey updates were undertaken. In planning such an update, it might be appropriate to consider carrying out a full and detailed inventory of equipment and materials, rather than just a survey.

.9 Superstructure—Software and Expertise

While equipment is important, it is of little value without supporting software and the expertise to use learning systems effectively. Equipment, though not abundant, is at least reasonably well-distributed across the province; on the other hand, software is in limited supply and is often out of date.

One of the major problems concerning software and expertise is the difficulty in assessing quality and merits. It is relatively easy to equate bulk with quality. Thus the tendency is to emphasize the more tangible aspects of media systems—hardware—and not provide a balance by a corresponding emphasis on the more intangible aspects of software and expertise.

Recognizing these possible shortcomings, the ETPNS made a special effort to redress the balance of media resources. The results reported here certainly do not complete the entire picture. What they do indicate, however, is that the initial premise was indeed correct: that considerably more attention will have to be paid to software and expertise in the future, if educational technology is ever likely to be in a position to live up to its full potential.

Following the format of the previous section, a simple report of the findings follows here. The next chapter will treat in more detail the question of possible steps towards solving some of the problems indicated.

.9.1 Software, Materials and Environments

Part of the questionnaire distributed to the schools treated the question of software resources in the province. The primary thrust of this section of the survey was to test the frequently-voiced complaint that not enough software was present in the province's schools. Many observers had long noted that equipment and proper environmental facilities must be complemented by a good range of software in order to provide the proper presentation of audio-visual related lessons and programs.

About 150 of the respondents to the survey indicated that their schools have no software, such as filmstrips, slides, overhead transparencies, and audio tape. This means that 23% of all schools in Nova Scotia have no software.

A further breakdown of this phenomenon follows:

16% of schools (14 reporting out of 89) in three amalgamation areas reported no software;

25% of schools (66 reporting out of 261) in the rural areas reported no software;

25% of schools (40 reporting out of 163) in the urban areas reported no software;

29% of the schools (5 reporting out of 17) in the regional school board areas reported no software.

The inescapable conclusion here is that funds must be made available for software acquisition in these schools.

Table 2-12. Quantities of Software

Type of Material	Number*
Transparencies	28000
Filmstrips	26500
Slides	15000
Records	13250
Audio Cassettes	9990
Audio Tapes	8435
Programmed Texts	2800
Multimedia Kits	1770
Super 8 Film	425
Video Tape	340
8mm Film	205
Video Cassettes	190
16mm Film	80

*Rounded to the nearest 5 units

Tables 2-12 and 2-13 are concerned with the quantities of software available in the school system, and the relationship between quantities of equipment and software. The most common software media reported were transparencies, filmstrips, slides and records. This finding correlates with corresponding equipment holdings. In general, most of the software was commercially produced;

however, some 40% of the transparencies were produced by teachers or students.

.9.2 Current Dollar Investment in Materials

To calculate the current dollar investment in the materials listed in Table 2-12, estimated average replacement costs of commercial materials as given in Table 2-14 were used. The replacement value of the commercially produced materials is about $1.3 million in 1975 dollars. In addition, locally produced materials such as slides, transparencies, and audio tapes might have a value of about $.02 million at most. A rough estimate of the total value of all these resources in Nova Scotian schools, or directly available to them in the case of 16mm films, is therefore about $1.5 million.

Table 2-14. Estimated Current Dollar Value of Materials

Materials	Cost/Unit ($)	Inventory	Value ($000)
Audio Tape	5	13,610	68.1
Video Tape	50	312	15.6
Super 8 film loops	25	186	4.7
16mm film*	200	4,700	940.0
Filmstrips	6	25,500	153.3
Records	5	13,009	65.0
Slides	0.50	8,843	4.4
Transparencies	0.50	16,772	8.4

* Including central library films at the Department of Education

.10 Provincial Resources

The Program of the Department of Education most concerned with resource services is the Cultural Services Program. The figure below indicates the position of Cultural Services within the department and also identifies the individual activities

Table 2-13. Relationship Between Equipment and Software

Materials	Quantity	Equipment	Quantity	Ratio of Materials to Equipment
Transparencies	28,000	Overhead projector	1020	27:1
Filmstrips	26,400	Filmstrip projectors	1020	26:1
Slides	15,000	Slide projectors	150	100:1
Records	13,300	Record players	1760	8:1
Audio Cassettes	10,000	Small cassette tape recorders	1070	9:1
Audio tapes	8,500	Reel to reel tape recorders	785	11:1
Super 8 film	425	Super 8 projectors	20	21:1
Video tapes	340	Videotape reel to reel machines	10	34:1
8 mm film	200	8 mm projectors	45	4:1
Video cassettes	190	Videotape cassette machines	4	48:1
16 mm film	80	16 mm projectors	625	*

*Because of cost, most 16 mm films are borrowed or rented rather than purchased.

within the program. While the Audio-Visual Service Activity is almost exclusively operated for the provision of services to schools, the Provincial Libraries and the Nova Scotia Museum are responsible for services to the community-at-large. However, both the Museum and the Provincial Library have staff who are specifically responsible for school services.

Note that in Figure 2-5, the Audio-Visual Instruction Activity within the Youth Education Program is another source of software. This activity is responsible for the provision of educational television and radio broadcasts. Although Audio-Visual Instruction and the Audio-Visual Services are parts of separate programs, they attempt to work closely together. For example, audio-tapes of all radio broadcasts and video-tapes of certain telecasts (those with rights cleared) are transferred from Audio-Visual Instruction to Audio-Visual Services, which provides a duplicating service for schools. There is nevertheless a gap in the communications between these two agencies, just as there are gaps between these agencies and those described below. This suggests the need for coordination and rationalization of some provincial services; this is treated in detail in Chapter 4.

.10.1 Audio-Visual Services Facilities

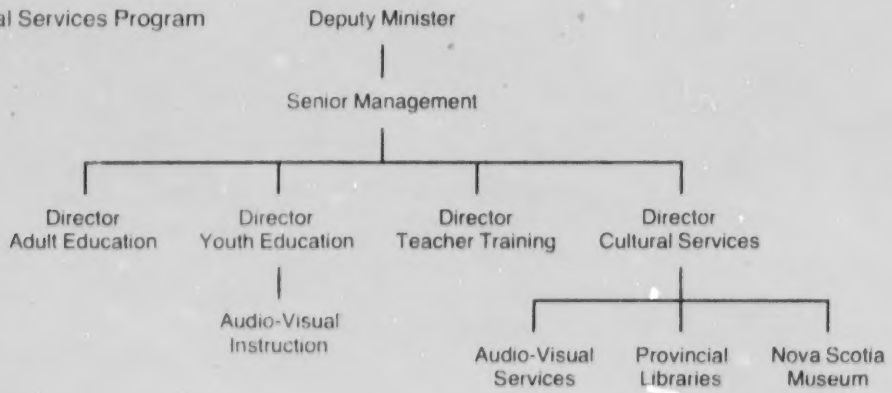
The Audio-Visual Services section of the Department of Education was established to assist teachers and administrators in the proper integration of audio-visual resources within the school system. It attempts to make available basic supportive services not provided by other administrative levels of education in the province.

Maintenance and Repair Service—This group provides a repair facility which is available to all schools in the province. The charge for repair is the wholesale cost of parts only. Free pick-up and delivery is available within a ten mile radius of Halifax. Equipment from outside this area must be shipped on a pre-paid basis.

The two technicians attempt to repair everything. Often the arrival of new and different equipment requires contacting the manufacturer for the service manual, causing repair delay. Even though the technicians perform an excellent service, the amount and range of equipment they are called upon to repair is excessive, causing inefficient service and adding to the cost that the educational system must bear. A more limited range of equipment for which servicing is offered and the addition of one or two more technicians seem to be warranted in order to alleviate many of the difficulties currently being experienced in the Audio-Visual Services section.

Other Services—Aside from the maintenance and repair facilities, Audio-Visual Services is attempting to supply the educational system with other services which are valuable to the teacher. For example, the Audio-Visual Film Library has been in operation for many years. Most of the teachers in the province have used the film library at one time or another. In addition to the film library, the Audio-Visual Services section has a photographic duplication service, a printing service, an audio tape duplication service, a graphic service, a video cassette duplication service and will shortly

Figure 2-5. Cultural Services Program



have an audio studio. A small selection of Super 8mm film loops[17] and 35mm slides is also available.

There are two means of distributing materials to schools—van and mail. A delivery van is used to service the schools within ten miles of the library. This includes the cities of Halifax and Dartmouth and the immediate county area. This represents approximately one third of the total number of students and teachers of the province. For the most part, however, the teachers outside this area have their materials sent by mail.

In 1972-73 the Audio-Visual Service reported that approximately 41,000 film deliveries were completed. Of these deliveries, approximately one-half were distributed via the van service to the Halifax-Dartmouth metropolitan area. This is only a minor discrepancy since the local area contains over 1/3 of the school population.

.10.2 Museums

The Nova Scotia Museum should more correctly be considered a resource network rather than a single institution. Most staff, major services, and exhibits are located in the main branch and headquarters in Halifax. Also in Halifax, located within the federally-owned Citadel Fortress, are marine history exhibits and additional exhibits depicting aspects of the province's social history.

Another part of the Museum is the Historic House system owned by the province: Uniacke House, Haliburton House, Prescott House, the Woolen Mill, Ross Farm, Perkins House, Balmoral Grist Mill, Sherbrooke Village, Lawrence House and the Ross Thompson House.

A recent federal program has resulted in the development of a series of Exhibit Centres. These will be used to display travelling exhibits. At present, such centres have been opened at Yarmouth, Bridgewater, Pictou and Sherbrooke.

Local museums, which are spread throughout the province, are another important aspect of the museum's work even though they are not provincially owned. These institutions operate autonomously, but receive assistance in the form of provincial grants.

The great potential of museum collections as a learning resource is often overlooked. Yet, in many cases, the artifact or specimen is the most valuable resource available. This is especially true when used in conjunction with other print and non-print media.

For the most part, it is necessary for students and teachers to visit one of the museums to make use of the collections. However, the Main Branch now employs two staff members who are preparing Museum Resource Kits and small Loan Collections which can be borrowed by schools. The Loan Collections simply consist of ten to twenty items such as minerals, shells, and so forth, with associated print materials. Museum Resource Kits are based on a range of other media—35mm slides, overhead transparencies, filmstrips, 16mm films, audio-tapes, print materials, *etc.*—which provide a context in which the collection can be interpreted.

The regional distribution services are located at Acadia University, the Yarmouth Museum, the Pictou Exhibit Centre, the Amherst Regional Library and the Glace Bay Miners' Museum. In each case, the institution has agreed to provide materials to the schools within an approximate thirty mile radius. Schools outside these areas must borrow the materials from the museum's main branch.

.10.3 Libraries

Educational resources are also available through the Teachers' Library contained within the Provincial Library organization, which has a book stock of over 750,000 volumes. The educational materials collection covers a wide range of topics and is the most extensive of its kind in the province. The support collection is for classroom use or may be used as a supplement for school libraries.

Special collections include fairly extensive holdings of poetry, fairy tales and legends, biography, crafts, and so forth. A varied collection of print and non-print materials on school library development, selection aids, library skills, children's literature and allied subjects is included also. These are used extensively by school librarians for in-service education, displays and orientation programs. The Reference Service section of the Provincial Library maintains an inter-library loan service for all libraries; this can be extremely important in providing software for students and teachers.

.10.4 Other Software Holdings

There are no other Provincial Government software sources established expressly to serve the needs of schools; however, there are several organizations that do have holdings which schools can use. Only in some cases are these holdings duplicated by Audio-Visual Services holdings.

A relatively unknown source of software materials is the Nova Scotia Communications and Information Centre. The centre's prime function is the production of material—print and non-print—to provide information about Nova Scotia. The print material, apart from press releases and material

prepared for specific functions, is available from the book store of the Nova Scotia Communications and Information Centre.

The non-print materials include approximately 14,000 black and white photographs (negative file maintained), some 40,000 colour negatives which include 35mm slides, and about twenty-five 16mm films. Teachers are able to borrow copies of the black and white photographs and the 35mm slides. However, at present they are not able to obtain copies for their own school collection.

The National Film Board has the second largest 16mm film holding in the province. Staff at the library estimate that loans to schools represent 70% of their total operation. As their holdings are composed of approximately 4,000 prints of some 1,500 titles, this represents a significant source of information for students and teachers of the province.

A branch of the main office in Halifax is located in Sydney, where there are about 800 prints. Two regional libraries—Amherst and Dartmouth—serve as affiliates. Each stocks about 100 titles, with the main office in Halifax providing a back-up service for additional requests.

One innovation being piloted by the NFB consists of a self-service film library. At present, this service in Halifax contains from 450 to 500 titles. People living within thirty miles of the NFB office are encouraged to use this service. Pre-booking is still available,however. Another innovation is a regional computerized film booking/control system with on-line terminals throughout Atlantic Canada. This service promises to expedite film delivery, accessibility and turnaround.

The International Education Centre located on the campus of Saint Mary's University was initially funded by the Canadian International Development Agency. The Centre's function is to familiarize Nova Scotians with developing nations. Although teachers are not yet well acquainted with the centre, its resources are available on loan. They consist of eleven 16mm films, 29 video tapes, 54 slide-tapes, and seven filmstrips.

The education departments of **Acadia** and **St. Francis Xavier Universities** have developed resource centres primarily to serve the needs of the student teachers, but they are also available to teachers in the area. The larger of the two is the centre at St. Francis Xavier. Other universities have resource centres, but these are not generally used outside of teacher education programs.

A number of companies in the province have provided very useful resources for schools. In some cases, these are intended as public relations material for the particular company and therefore relate to aspects of its operation. In other cases, the films are merely sponsored by the company and bear no relation to their operation.

.11 Expertise—Educational Programs

One of the primary concerns involved with using educational technology in the schools is the problem of the teacher's ability to use educational devices in a constructive classroom setting. This problem is aggravated by inadequate equipment holdings and the lack of program materials. The frequency with which new devices come on the market as well as the frequent introduction of new programs contributes to a mystifying situation which baffles all but the most dedicated.

This kind of situation is clearly undesirable. One of the first steps which might be taken to help meet the problem is an upgrading program at the pre-service and in-service teaching levels. Now that we have seen some of the problems in the area of equipment and software, our hope is to outline some preliminary steps towards a systematic solution. These steps are treated in the subsequent chapters.

It is important to know what facilities do exist in teacher education, so as to establish a base to work from in future innovations. There are various approaches to professional development in educational technology in the Province of Nova Scotia. In order to determine some of the characteristics of these programs, a study on teacher instruction in the use of educational technology [18] was conducted.

The study was aimed at collecting information on the following topics: courses designed specifically to instruct in the use and application of educational technology; courses touching on some aspects of educational technology; and workshops organized by the institutions around the educational technology theme.

A variety of courses on educational technology and educational media is offered by Nova Scotian universities and colleges. Courses for credit are offered by Acadia University, the Atlantic Institute of Education, Dalhousie University and Saint Francis Xavier University. There is no consistency among these courses, as some courses stress different aspects of media and technology, while others vary from practical to theoretical treatments.

Some other institutions in Nova Scotia offer programs on educational technology as part of another course, resulting in only a brief treatment of the

subject in any given year. In all cases a shortage of hardware and instructional facilities was an inhibiting factor on further course expansion.

The diversity among the teacher education institutions regarding courses in educational technology seems to be caused mainly by the constraints of the programs in education in each university. One year programs do not allow enough time to present the varied aspects of educational technology and might simply provide for the discussion of equipment operation. Longer programs can provide greater flexibility in course design. These constraints demand that individual professors and students rely upon their own initiative.

Interviewers also approached school boards, teachers, and the Nova Scotia Teachers' Union (NSTU) to inquire about informal programs providing in-service education in educational technology. The NSTU tries to support new programs but does not become directly involved by offering courses of its own. School boards are somewhat more actively involved, often sponsoring workshops for teachers on the use of audio-visual media. These workshops can last from one day to a week.

For the last few years, the "Administration Block" of the Nova Scotia Summer School has included a course in educational technology, open to all interested teachers. Another four-summer program, developed and administered by personnel at the Nova Scotia Teachers' College in Truro, consists of eighteen courses divided evenly into three areas: library skills, educational technology, and courses which tie skills and technology together. This program is recognized by librarians as providing adequate instruction for school teachers.

In summary, the evidence indicates that many teachers and students of education have opportunities to encounter some aspects of educational technology, such as equipment operation, while a much smaller proportion receive instruction in the role of educational technology in the learning process. Few people, however, have the opportunity to receive advanced studies in educational technology.

.11.1 Teachers' Views

In the field seminars[19], teachers and administrators were asked to express their views on audio-visual education in the province. One of the main observations was that there is a scarcity of trained people able to assist teachers in the field of educational technology. Concern was also expressed about the lack of adequate facilities for the repair and maintenance of hardware.

The most pressing concern was the inadequate preparation in educational technology which teachers received at the pre-service institutions they attended. In their view, in-service work would be the best way of making up for this deficiency.

In dealing with the question of in-service programs, the educators stated that for them to be effective, the time allowed should be greater, sessions should be conducted in smaller groups, and teachers should have more hands-on access to the equipment. Many teachers supported the concept of having a full-time media coordinator or educational technologist available to help them in preparing and applying materials.

Another finding indicated that although approximately 50% of the teachers of the province have been exposed to some educational technology, most of this exposure has been in terms of equipment operation only. Many educators have suggested that this kind of exposure is not adequate. Many of the workshop participants felt they lacked the comprehensive grounding in the various techniques necessary to develop the competence required to apply educational technology in the classroom.

The critical problem in assessing the competence of those who have had formal and informal training is the lack of a relevant training standard upon which to base any comparative analysis and evaluation. Since there is no standard, it would appear that the competence of the program graduates depends mainly upon their own interest in learning about educational technology from the courses available and upon their own initiative. Yet, by any standard, pre-service and in-service teacher development in educational technology in the province is not adequate. Furthermore, there is currently no place for educational technology specialists in the educational hierarchy. Therefore, any program to encourage specialization in educational technology must at the same time encourage the creation of an acceptable area of employment for these specialists.

The groundwork is presently being laid by those who see educational technology as a valuable part of the educational process. Teachers are asking for professional development in the field of educational technology and for help in program design from media specialists. Therefore, proper planning procedures are required for the future of educational technology within the province to ensure the coordinated effort necessary for proper utilization of educational technology in the classrooms of Nova Scotia.

.12 The Balance

Perhaps the most important conclusion which can be drawn from the findings related here is that there exists a basic foundation which could support a further expansion of educational technology in the province. However, the superstructure, both in terms of software and level of expertise, offers a considerably more limited capacity for development in educational technology.

This is not a comforting finding. It means, for example, that there is an imbalance between our capacity to expand a given technology on the one hand, and our intellectual resources to control and use it properly on the other. This demonstrates a marked misplacement of priorities.

Presumably, in an ideal situation, a great deal more expertise, information, and organizational resources would be available to deal with both equipment and material resources (hardware **and** software) in their proper proportion and importance. This would ensure the orderly development of technology. In actual practise, however, it appears that equipment and hardware may very well be developing on their own initiative, with little attention being given to support facilities or services which would permit effective equipment utilization at the learning point.

It might be said that this study is an attempt to improve the balance and to create a greater equality between technological development and the teacher expertise present to deal with it. The recommendations of this study should lead to a continuous, long-term development of information and expertise to match technological growth. It seems clear to us that teacher training is the place where the most significant impact can be made in the state of expertise in the use of educational technology. The role of the teacher as a motivational force within the system of education cannot be overemphasized. A first priority must therefore be to strengthen teachers' capacities to perform their role to the best of their ability.

Secondly, it seems that a greater store and use of software resources must be developed. This can emerge out of two separate approaches: many resources can be made more readily available by improving the distribution system and by making them more accessible to potential users. Another approach is to have software produced locally. Greater availability of software will, of course, upgrade our collective store of knowledge and thus start a positive cycle of software to information to knowledge to better use of technology, and so on.

The overall solution therefore clearly lies in the development of expertise in implementing, using and managing equipment and software resources. The method of proceeding along this path is discussed in the next two chapters. Also discussed are the numerous significant benefits to be gained by placing an emphasis on the teacher as a prime mover in the educational process.

Footnotes to Chapter 2

1. Summarized in ETPNS Working Paper No. 6405, "A Survey of Equipment and Materials".
2. This expansion would require a modification which would involve a relatively substantial investment, however, since existing amplifier modules would have to be upgraded. Cable systems in Nova Scotia have a range of from 250 to 2000 amplifier modules on their respective systems and each module costs in excess of $200 to change.
3. Broadcasting Act, S.C. 1967-68, ch. 25 ; (revised) R.S.C. 1970, ch. B-11 as amended in R.S.C. 1970, ch. 16 (1st supp.), s.42(2), and R.S.C. 1970, c. 10,(2nd supp.), s.65.
4. *Ibid.*, s.3a.
5. CRTC. "Policy Statement on Cable Television." CRTC announcement. Ottawa: CRTC, 16 July 1971.
6. ———. "Feature Motion Pictures on Cable." CRTC announcement. Ottawa: CRTC, 5 December 1973.
7. ———. "Proposed Regulations Respecting Broadcasting Receiving Undertakings." CRTC announcement. Ottawa: CRTC, 17 February 1975, Reg.10(1).
8. ———. "Policy Statement Concerning the Community Channel." CRTC announcement. Ottawa: CRTC, 17 February 1975.
9. Order-in-Council P.C. 1970-496, SOR/70-113, *Canada Gazette*, Part II, April 1970, p. 381.
10. ETPNS. "Network Resources Study." Working paper No. 6406.
11. ———. "Survey of Educational Equipment and Materials." Working Paper No. 6405.
12. ———. "Computers in Education." Working Paper No. 6413.
13. "Program for the Sharing of Computer Resources in the Atlantic Universities." A study under the auspices of the federal Department of Communications, the Government of Newfoundland and Labrador, the Maritime Provinces Higher Education Commission, and the Association of Atlantic Universities.
14. ETPNS Working Paper No. 6405, *op. cit.*
15. The figures for Canada are drawn from C.E. Wilkenson, "Results of Survey for Year Three",

School Progress, McLean Hunter Publications, Toronto, January 1972.

16. The Royal Commission on Education, Public Services and Provincial-Municipal Relations, *op. cit.*
17. Super 8 film is about 50% larger than regular 8 mm film.
18. ETPNS. "Study of Teacher Instruction in the Use of Educational Technology." Working Paper No. 6426.
19. ETPNS Working Paper No. 6425, *op. cit.*

3 PRINCIPLES, CHOICES AND PROPOSALS

ETPNS investigations suggest that educational technology within the schools of Nova Scotia is at a basic, but growing, stage of development. It is disturbing that there is more equipment available in the province than either expertise or software; this results in poorly-utilized equipment (itself not abundant) and suggests a shortage of expertise in managing educational technology growth. On the basis of this knowledge and the accompanying insight into key areas of potential action, the ETPNS can proceed with defining some appropriate rough first steps towards improving the use of educational technology in the schools.

This process of improvement can be initiated by identifying some of the underlying background principles which should serve as a reference point upon which subsequent steps can be based. These underlying principles will further suggest a philosophy of viewing the future of educational technology in the province; as such, they will provide some tentative standards to work with and preliminary methods of judging the efficacy of any further proposals.

There are no standards which define, *absolutely*, what precise steps should be taken. No amount of research can ever provide these standards. The future course of technological development in the schools will be set by past conventions, by physical and financial constraints (such as the availability of funds for computers), and by the kind of informed discussion and search for consensus which this kind of report can generate. From this, more definitive standards will emerge if not in the form of clear goals, then at least in the form of well-defined principles regarding the quality of education desired and what steps are appropriate and acceptable in order to obtain it.

The aim of this chapter and the next, when seen in this light, is simply to define what is possible, and to remove some of the mystery surrounding these possibilities, as a means of providing a clear background for the discussion to follow. Since there are a number of paths which educational technology can take in the future, and since there is no single panacea apparent which could solve the problems already identified, such a clear view of the various alternatives is necessary. Thus, while standing at the crossroads of numerous paths, at least potential dead-end solutions can be eliminated, and the most promising futures explored as an aid to those in the province who must work together to forge a consistent approach to educational technology.

One thing is clear from the findings already presented in this report: neither the equipment needed

nor the basic principles relating to its use have been spelled out and clearly defined in the past. So far, recent technological innovations have not been adequately integrated into the educational process. Now it must be decided how this integration can be accomplished and how much integration should be attempted.

Any delay in dealing with this integration is of major significance in a situation of accelerating technology and its accompanying impacts. This could place the province in an even more disadvantageous position. The approach advocated here therefore represents a compromise between the two possibilities of discussion or action. It is undoubtedly true that further studies could be conducted, and further discussions entertained. But time to initiate change is short, and it would therefore be wise to formulate some preliminary plans now for the orderly development of technological aids in the education of youth and adults in Nova Scotia.

It is possible to act now—providing some basic precautions are taken. These involve discussing the program with a number and variety of people as mentioned earlier, examining the existing situation in the schools very carefully, and looking at relevant situations elsewhere. The changes proposed are therefore based on both research and upon reasonable and informed discussions by a variety of people.

The proposals here fall into two categories: one, to be treated in this chapter, deals with a tentative re-definition of some of the approaches to educational technology in the province. Another set of proposals, to be discussed in the next chapter, deals less with the question of approach, and more with the means of giving expression to the approach we determine. These means are based on either the acquisition of further hardware and software resources, or on methods of using the existing resources in the province in a more effective fashion.

.1 The Principle of Evaluation

Only in recent years, and after some catastrophic failures in what seemed to be the best of all possible designs, have policy makers begun to see a more broadened and legitimate role for evaluation of changes in basic social or economic situations. This of course applies to education.

One traditional role of evaluation is to test the effect of change on a limited basis before larger changes are applied on a wide scale to broader systems. This normally takes place in the form of a pilot (or demonstration) project with before-and-after measurements of project performance. Evaluation is also used on a continuing basis after a program is implemented. Although evaluations are not always possible, and even though they may involve increased costs, their value provides compelling reasons for undertaking them.

To have a thorough evaluation, it is essential to define as exactly as possible what the project is intended to do before it is begun. This is necessary to establish a base from which any changes caused by the project can be measured. **The simple act of defining what is desired, in a clear and precise fashion, is a necessary discipline which, in itself, can clear up many of the deleterious side-effects of otherwise fuzzy thinking.**

Other benefits of evaluations accrue as a result of projecting the possible undesirable side-effects which the demonstration program might produce. Many of these unintended consequences of the pilot can be dispatched right from the beginning if they are identified and dealt with at the outset rather than after the program starts. As part of the search for negative effects accruing from the pilot project, program participants should be consulted in advance of the demonstration. This kind of preliminary consulation is most beneficial and involves the element of feedback to program planners which should be encouraged not only initially, but as the program continues.

An important goal of an evaluation is to tell the quality of the proposed project, using such criteria as cost savings, effectiveness, participant's response, *etc.* Having indicated this, a good evaluation will provide valuable information, in general terms, to enable decision-makers to assess whether the project is worth continuing and, if it continues, what can be done to improve it. The element of feedback creates a continuous participant involvement in the success or failure of the project and a constant source of new and informed suggestions for constructive change.

Specific changes are not always necessary. Indeed, even the most subtle of changes can introduce havoc in a finely-tuned system. For example, on the surface, the concept of self-instruction via computer might seem ideal in that it individualizes instruction, seems to pay greater attention to the needs of a student than a teacher perhaps may, and has a wider range of resources and access to information than is otherwise available.

A sound evaluation would look for possible side-effects, or what are known as the third and fourth order consequences, caused by the operation of such a system. For example, what are the personality attributes of someone who is being taught by machine rather than by a teacher? What are the costs to regular methods of organization in the classroom in the presence of programming by machines? Do these procedures atrophy? If so, with what effects? How might teachers react at the end of this process should they be reduced to the role of computer custodian as opposed to director of a number of educational resources? What kind of balance between man and machine can be achieved to avert these side effects, if they are indeed produced? Or simply, are the costs justified?

These questions must be formulated beforehand and must be worked out as the project continues. This must be done on a controlled basis in order to avoid inefficient expenditure of funds.

The ETPNS therefore strongly favours the concept of evaluation and proposes several means of implementing evaluations in any future program phases. Rather than blanket changes we suggest limited changes, on a pilot basis. If pilot programs prove successful, then they can be broadened. As the program is broadened, the role of evaluation can then shift towards a continuous participants' feedback during a full-scale program.

The proper use of evaluation makes possible the introduction of change on a basis of controlled impact, without demanding a prohibitively long time to study effects before permanent full-scale changes can be introduced. This is based on the assumption that a pilot, and appropriate evaluation, will reveal the deficiencies of a program, and will make recommendations regarding how it may be improved on an operational basis. It also assumes that if a program has a negative impact, it can be withdrawn with a minimum adverse effect. The likelihood of the project's success is increased before, during, and after implementation by providing an essential mechanism for participants to influence program development.

In order to implement this philosophy several proposals are suggested here for consideration.

The Department of Education should put into effect more broadly and actively its commitment to evaluation as a general philosophy behind all its programs—existing and future—including the elements of piloting innovations and encouraging continuous participant feedback in long-term projects.

Proper evaluation techniques and criteria are proposed as an integral element of all pilot projects to be undertaken in subsequent phases of the Educational Technology Program. Projects should therefore have well-defined goals and structure from the outset.

People engaged in all levels of education should be made aware of the potential and importance of the evaluation process through such vehicles as periodicals, the press, seminars and conferences. Along this line, a guide book for teachers outlining the application of evaluation methods in selection of appropriate technological media for their needs should be developed.

The implementation of these proposals will reinforce the concept of evaluation, enabling it to be carried forward and actualized. Ideally, sound evaluation policies may be established and implemented as standard procedure. Hopefully, potential shortcomings of any change will be corrected by early evaluation. In the long run, if more people are sensitized to the necessity of evaluation they may be more specific and careful about what it is they want to do and how they go about doing it.

A commitment to this approach introduces a great deal of flexibility into the activities of the Department of Education and to the ETPNS. It means, for example, that in subsequent phases of the ETPNS, projects can be introduced and piloted and allowed to stand or be abandoned on their merits as revealed by an evaluation.

.2 The Learning Environment

Once a commitment to evaluation is made it is necessary to establish basic standards upon which evaluative criteria can be set. It seemed clear to the ETPNS staff that for educational technology to enhance the educational process, either by improving learning opportunities or by enriching the learning process, it would have to be available to students and teachers at a very basic and accessible level. Educational technology must therefore be the servant of the learning process, not *vice versa*.

Thus the actual learning point must be stressed in determining the quality of educational technology. It is not important whether learning takes place in a school or in a library outside a school—as long as it does take place. This means that the efficacy of a learning environment cannot be based on its historical or institutional structure. Thus, it is

not automatically assumed that a classroom, or even a school for that matter, is a "good" place to learn simply because it happens to be what it is. A good place to learn can be judged only on the basis of a thorough evaluation. This applies to learning (or teaching) **methods** as well.

The focus on the learning point has another role. The emphasis on a learning environment is designed to produce better results than, for example, placing the emphasis on the administrative structure of educational technology. This is an important concept. It seemed clear from the discussions during the course of the Initial Phase, and from relevant studies elsewhere, that if educational technology was to work successfully it could not be something which was abstract, mysterious or inaccessible. It would be clearly undesirable, for example, to have technology applied at a high organizational level or from a remote location such as Halifax without first specifying why and how this would benefit the end user.

There are probably costs associated with this approach. It is likely that the process of establishing any given technological innovation will be made more cumbersome by having to integrate it into a working environment where the teachers and students interact. Project coordinators could perhaps more easily control the technological innovations from a central point. But such a system would be less flexible and less subject to the control of the user—whether it be teacher or student. The benefits of immediate control and flexibility outweigh the disadvantages.

In order to provide for accessibility, a model of a distribution network has been developed for use within a teaching/learning environment. This network is described in the closing section of the next chapter. It represents an attempt to balance centralization against decentralization in order to maximize the benefits of both at the learning point.

.3 Learning Systems

There has already been considerable discussion of systems in this report. The word "systems", like the word "technology", becomes ambiguous with too much use, in that it can be applied to everything, or nothing—or so it seems. Perhaps this ambiguity, or lack of meaning, accounts for the apprehension sometimes felt when these words are spoken.

Yet by emphasizing learning systems it seems possible to impart a more humanizing role to educational technology than would otherwise be possible. Problems do not disappear by deciding simply not to view them or, in this context, deciding not to look at them all together, in their entirety. On the other hand, by viewing the problem as a related system of sub-problems, then general steps can be proposed to solve the problem as a whole, rather than to treat symptoms. This will benefit the learner.

The ETPNS investigation found much evidence of essentially un-systematic ways of doing things with educational technology in the province. Educational devices cannot be effectively utilized if back-up support services are not available at the learning point when needed. For example, if 16mm films cannot be obtained, or if room darkening facilities are not available, there is no value in having access to a modern 16mm projector in good repair.

It is imperative that the inter-relationship of educational resources and of back-up support services required to use these resources be taken into account. This leads to a very basic principle: the first improvements to be made in the educational technology field must be in those areas where media system elements are non-existent or are in limited supply, and in areas where back-up support services are not readily available. Essentially, this implies that efforts be directed towards rationalizing and rounding out existing systems before any new systems are proposed or introduced.

.4 Teacher Responsibility

The teacher, probably more than anyone else, breathes life into the educational system—or should breathe life into the system of education. The success or failure of any innovation in education rests upon the reception and application of the concept by the teacher. This realization represents an important limit to the expansion of educational technology as well as a point of departure of enormous significance and potential.

The teacher, as the primary figure in the classroom, is a central focus through which the numerous separate elements of technological systems ultimately pass. Any moves towards changing our concepts of technology, as well as our way of using and developing technology, must therefore start with the teacher.

Perhaps the simplest and easiest way of bringing about educational change is to make sure that the important role of the teacher is fully recognized. In the past, technology has occasionally failed to realize expectations and has tended to detract from the teacher's role. Teaching machines and educational television, for example, may promise to improve the teacher's performance and bring more consistency

to classroom results, but they can also confine the teacher's range of possibilities and may even contribute to a feeling of the teacher not caring, or not being responsible. The technology can similarly affect the students by dramatically changing both their relationship to the teacher and their willingness to learn.

Yet teaching is a key factor in education (along with learning and the learner) and teachers are the professionals who are charged with assuring the day-to-day progress of learning. Thus, a change in teaching procedures can have an immediate impact throughout the whole educational structure.

It should be clear that educational technology cannot replace the teacher. But it is nevertheless true that technology has a great potential to change teachers' activities enormously. It therefore seems reasonable to arm teachers with a range of skills and concepts, and to make technology available to them, so that they can control and manage change and, in the process, make it change for the better.

This kind of teacher knowledge must be thorough and far-reaching. With a thorough understanding of technology it is possible to mould and shape the pattern of technological development in the classroom. On the other hand, if one simply knows how to use technology, or knows only approximately what it does, the situation is reversed and can have dangerous consequences—for in this situation it is **technology** which is controlling the **teacher**. In a situation of changing educational goals and procedures the teacher must have the ability to alter technology in order to make adjustments. This philosophy applies equally to students and, in fact, to anyone involved with technology in the learning environment.

The goal therefore must be towards a thorough understanding of technology at the learning point. This kind of understanding can be best accomplished through the systematic development of teacher expertise in this field. Through the teacher, students and others can be given the same kind of understanding.

This seems an inescapable conclusion. Teachers and students, like all other individuals in the face of technology, have one precise and definite veto over change—the power to curtail or limit their participation in the technological framework of a given device if it is not to their liking. By withdrawing and limiting this participation, the effectiveness of any measure, whatever it is designed to do, can be impaired.

Even worse is the possibility of being affected by technology and not knowing it; of ignoring the situation around us entirely and doing nothing, becoming more entrenched in the process every day. Educators must therefore not react to technology by learning to use is merely as part of a routine, for it is especially true in education that our ability to improve something depends on our recognition of the bad effects it is having upon us.

The aim should therefore be to equip teachers with the tools necessary to handle the situation presented by technology in a constructive fashion. The major tool here seems to be teacher education. In the field seminars, teachers claimed that the lack of expertise impaired their ability to cope with technology and to use it effectively. This appeared to be a major reason behind costly resources gathering dust in school closets throughout the province.

The way in which teacher education itself is structured is also exceedingly important. Ultimately, teachers must be exposed to a wide variety of educational technologies, in **all** their courses, for ultimately this will be the only certain way of ensuring its successful application in the learning environment. Thus, just as our teaching methods tend to develop in a large degree from the way we are taught, rather than from any single course on teaching methodology, so too will our understanding and conception of educational technology emerge from the way it is employed in teacher education, rather than from any single course on educational technology.

.4.1 Teacher Education and Support Services

To compensate for insufficient grounding in the use of technology, teachers have had to rely on their own initiative and knowledge to try to utilize available resources in their teaching units. This has produced some interesting results: in many cases, schools with limited resources have been more successful in the proper implementation of audio-visual materials and equipment than have well-endowed schools. Yet there are many constraints involved in using such equipment and a great variation in the degree of sophistication in the use of this equipment exists among teachers and principals in both urban and rural areas.

In order to come to grips with this problem of variation, the Department of Education of the Province of Nova Scotia must make a major commitment to the reorganization of both pre-service and in-service teacher education in relation to educational technology. Recommendations concerning

future preparation of teachers for informed utilization of educational technology are dependent on the educational objectives of the Department of Education and the place educational technology takes within the educational system.

As a second step, the Department of Education should work towards viable integration of all relevant technological resources. Technologies such as the computer are already being relied upon by some schools in Nova Scotia. Yet no program exists whereby teachers and administrators can learn about computers. The Department of Education must plan to ensure that teachers and administrators are informed of developments in the use of technology. Efforts should be made to protect the educators of the province from being enmeshed in new educational resources which they are totally unprepared to comprehend or accept.

As many teachers have pointed out, the only way to overcome their inadequacies vis-à-vis educational technology is to set up more comprehensive programs for in-service education. This is indeed necessary; in-service education plays the essential role of informing professionals of new concepts and showing ways to put these concepts into practice.

It is suggested that this in-service training procedure be used in keeping teachers informed of all relevant resources available to them. However, before this can be implemented, it is necessary to first build up a sound base in knowledge of educational technology through remedial in-service education and new studies in pre-service education. There must also be a source of knowledge and expertise in educational technology which all educators and students can draw upon for necessary advice and assistance.

The attitudes of educators, in some instances, must change so that they may integrate all resources (including the technological ones) into the educational process. A teacher's knowledge of educational equipment and materials must be broadly-grounded to enable that teacher to recognize the unique strengths and weaknesses of technology and thereby use it more effectively.

Teachers must have the opportunity to develop basic skills in the design and production of materials, the proper use of these materials, and evaluation procedures necessary to realize their effectiveness. In short, it is vital that teachers appreciate and understand a systematic approach to learning which would encompass an understanding of technology in education.

Teachers, when asked, stated that in order to utilize educational technology properly they require:

- pre-service education
- in-service education to bring teachers up to date on instructional technology
- resource specialists trained in educational technology to assist teachers in the same manner as do librarians, curriculum specialists, and special class teachers
- resource people trained in media to assist teachers in production techniques, maintenance and repair, and other types of similar activities

A thorough grounding in educational technology does not stop with teacher education. People trained in media technology can be an important asset to the learning situation. These persons could be responsible for taking much of the load off teachers' schedules, leaving them more time to devote to their students' needs. Consequently, when discussing the development of an understanding of educational technology, it is necessary to break recommendations down into two areas: educational pre-service and in-service training; educational support training (media technologists).

.4.2 Teacher Education—Pre-Service

Pre-service study of educational technology could take place at three levels. Each of these levels would be designed towards the specific placement of persons in various sectors of the educational structure, as is the case for people who work in special education.

Level I—Each teacher would have as a part of an education program a basic survey course in educational technology. This would satisfy the needs of the general education student by exposing him to the fundamentals necessary to implement an integrated approach to learning in the classroom. The course content would be divided into various sections involving the following.

(i) A systematic approach to instruction and educational planning.

(ii) A wide range of learning resources and the equipment associated with these resources. This includes film, television, slides and other media. It also includes community facilities such as museums, natural resources, and community sites.

(iii) Principles affecting educational and instructional planning, learning theories, communication theories, engineering principles, information science principles and architectural principles.

(iv) Evaluation. Although evaluation is part of the systematic process, it deserves separate

mention; formative evaluation, summary evaluation, internal evaluation seem appropriate elementa to be included.

Educational technology should not be examined in isolation. Any course should require the student to immediately apply his knowledge to an instructional situation. For instance, the student may use the principles and practices of educational technology to plan and implement a mathematics course.

Level II—Institutions of higher learning would offer a series of advanced courses in educational technology so that specialist teachers might be prepared for the educational system. A program of this nature would develop, in depth, the elements of educational technology that were simply touched upon in the first basic course. The teacher would be considered a specialist in the basic field course. A simple program of studies could be drawn from the options listed below:

- Learning theory and instructional design
- Communication theory and instructional design
- Instructional planning
- Educational planning
- Information science—storage, cataloging and retrieval
- Message design for instructional systems
- Evaluation
- Accountability
- Administration
- Visual literacy
- Graphics design and production
- Motion picture and television production
- Still photography
- Media research
- Programmed instruction
- Computer-assisted learning
- Educational uses of the computer
- Simulation, gaming and case studies
- Learning resource centres

Level III—Graduate programs in educational technology could be offered within the province. Incentives could also be provided for those persons who wish to pursue an academic career in this field at one of the institutions in North America which offers such a program.

This is an extremely important aspect of an overall program for the integration of educational technology into the Nova Scotia school system. If Levels I and II are to be considered, it will be necessary to staff several universities with qualified educational technologists. The Department of Education would similarly require this type of personnel in the areas of curriculum design and educational television. In addition to this, larger school boards or groups of smaller boards could hire educational technologists to help them plan curriculum and professional development programs for teachers.

If these levels of pre-service education are viewed as contributing to a better educational system in Nova Scotia, then it will be necessary for the Department of Education to take formal steps to encourage the pre-service institutions to implement such programs. Also, since these programs would take time to implement, it would be necessary to act quickly to arrange in-service sessions for teachers already in the field. This would enable practicing teachers to learn what new teachers would be learning in their pre-service sessions.

Pre-service programs should offer support to teachers in three ways: (i) by offering opportunities for students to specialize in educational technology; (ii) by offering specific courses in educational technology which would complement the courses being taken by elementary or secondary teachers; and (iii) by including media techniques within university courses which can be used by the teacher in a particular subject.

One recommended change which should facilitate the first type of support is that of recognizing the graduates of the Nova Scotia Teachers College course for Media Resource Specialists. It is recommended that school boards hiring these graduates be eligible for the same cost-sharing arrangement as is presently available for qualified librarians. Teachers indicated at the field seminars that resource specialists who could assist them in developing learning materials were essential. However, it was also considered essential that such specialists be able to assist with a broad range of resources including print as well as audio-visual media. This general approach is the one adopted by the Teachers College Program.

.4.3 Teacher Education—In-Service

It is fundamental that in-service sessions in educational technology be encouraged by administrators at all levels of the educational system in Nova Scotia. The ways in which these in-service sessions are conducted are also important since both teachers and administrators have expressed a desire to change the in-service concept with respect to a teacher's professional development. Therefore, suggestions concerning in-service sessions in educational technology should be with the view to influencing present policies on in-service programs at both the school board and department levels. In addition, the fact that any in-service sessions in educational technology could eventually become

full credit courses requires that such programs be developed with two principles in mind:

(a) that any in-service programs be developed in conjunction with the proper administrative authorities, including the Department of Education, university deans, school board authorities, and other key bodies;

(b) that the structure of in-service programs in educational technology be used as a basis for models of the professional development of teachers in all disciplines.

It is imperative that the planning of in-service sessions in educational technology begin as soon as possible to facilitate the proper integration of educational technology within the structure of the educational system of Nova Scotia.

.4.4 Towards Programs In Educational Technology

Many steps will have to be taken by both the Department of Education and other educational institutions in order to implement a comprehensive educational technology program for teachers in Nova Scotia. Some suggested steps are outlined below.

The Department of Education should recognize the area of educational technology as a specialist area in terms of certification and should set standards for educating specialists in cooperation with teacher education institutions.

The department should modify the foundation grant formula to include salary support to boards which hire people who are qualified to act as regional, district, and school educational technology supervisors or coordinators.

The Department of Education should encourage teacher education institutions to make policy commitments on providing pre-service and in-service credit to educational technology courses for students and practicing teachers in the field.

The department should cooperate with organizations (such as the Atlantic Institute of Education) willing to develop pre-service and in-service programs for teachers in Nova Scotia.

The Department of Education should encourage the school boards to make a formal commitment to educational technology.

The department should investigate possible incentives for teachers to attend in-service sessions and workshops in educational technology. These workshops could be offered as "partial credit" towards license upgrading.

The Department of Education should work in conjunction with regional school authorities to establish regional resource services which could offer in-service programs to teachers.

School Boards

The school boards' educational administration staffs should demonstrate leadership in establishing policy regarding educational technology in their schools and informing the public of such action.

School boards should work with the Department of Education with the intent of establishing regional resource services, staffed by resource people (librarians, instructional technologists, media technicians) who would provide expert help and act as in-service education consultants.

The Nova Scotia Teachers Union

The NSTU should reaffirm its earlier commitment to educational technology.

The NSTU should have an active professional development committee working in this area, thereby reasserting the desires of the member teachers.

It is important to develop existing expertise in addition to these steps. Thus, teachers in each of the regions who have developed techniques which would be of use to others in the region should be identified. Situations must then be developed which will allow teachers to share these ideas on a continuing basis. This sharing should take place through a coordinated regional resource sharing agency which can serve as a focus for much of what is developed in each of the regions or as a point through which one can gain access to outside resources.

Seminars should be held with the resource teachers in each region in order that they may become more aware of resources and assistance available to them from outside the region. Assistance could also be given in setting up initial workshop sessions with teachers, on either a school or district level, in conjunction with principals and superintendents. The expectation is to have these workshops continue.

At these workshop sessions teachers could be introduced to two self-help devices. The first would be a guide to the use and application of the basic

equipment outlined in the next chapter. The second would be a series of Learning Modules to be developed by such bodies as the Atlantic Institute of Education. Each module would illustrate a variety of approaches to the teaching of a subject area using a wide range of resources.

Schools which have developed an innovative approach to a subject area could either add this to a module or develop a new module so that the idea may be shared with others. It would be the role of the Teaching Resources Clearing House to catalogue and disseminate information about new modules which are created.

The Teacher Education Program of the Department of Education will be coordinating in-service education. Although the approach outlined above will serve as a core, other developments such as evening or summer school courses may well be developed if and when the need is apparent. Teachers at the seminars were quick to point out that there is little gained in adding equipment unless there is access to software. Some of the tangible steps which could be taken to meet this requirement are described in the next chapter.

It is also advocated that the resources in each school, whether purchased through existing funds, or produced by a teacher, be centrally located or at least catalogued within the library holdings. This is advocated in spite of the fact that not all schools have libraries: the means of access to the catalogue can be developed whether an actual library space exists or not.

It is also suggested that the staff of the Teacher's Library of the Department of Education be increased so that more support can be offered schools in both the selection of resources and the development of library facilities. It is important to emphasize that the philosophy of this report is to equate the term "school library" with the term "resource centre". This is to emphasize the establishment of a broader role for the library, to be considered as the central repository or information source for all materials and resources which can have common use by teachers in the schools. In these terms, a resource can be the traditional book, filmstrip, overhead transparency or slide, but it can also include a person in the community or a place which can be visited.

The opportunity for teachers to develop their own materials will in many cases be the most significant source of new resources for the school. However, as teachers have indicated, this local production, and the beneficial application of the resources developed, greatly depends on the prerequisite education outlined above and the provision of the basic equipment. The equipment aspect of educational technology is taken up in the next chapter.

.4.5 Educational Support Training—The Media Technologist

Under the present educational system in Nova Scotia and elsewhere, there is a growing demand for persons who are highly trained in the area of media technology. It is generally recognized that it is most important for teachers to spend more time with their students in individual consultation and help. Educators are asking for help in planning and presenting their programs. Consequently, there has been an influx of teacher aides and other resource people who allow the teacher to devote more time to the individual child.

Many of the practices of educational technology definitely help the teacher by lessening the load, but there is still a great deal of time involved in planning, producing, and presenting a teaching unit such as a video tape or a slide show. Media technologists would alleviate many of the problems associated with such efforts. A media technologist, trained in educational theory, and given an understanding of teacher's problems, could be most valuable where competence in such fields as media production, photography, graphics, and maintenance and repair is required.

If trained media technologists were available, it would be possible for teachers to learn, understand, and apply the fundamental principles of educational technology on a broader level. It would be the responsibility of the media technologist to help the teacher to prepare professional programs for the teacher's instructional units.

In the future, a variety of schools, especially large central ones like Breton Educational Centre in New Waterford, could have media technologists on staff. Regions or groups of smaller schools could share personnel trained in this field. It would not be necessary for the educational system to be the only employer of graduates in media technology. These people could provide invaluable service in training divisions of industry and in public relations areas in government and elsewhere.

The question of training programs in media technology raises two points: first, people presently active as media technologists are interested in obtaining additional training in the field; second, new candidates require training for the job market. Any

consideration of developing a program, then, must include the needs of both groups. The continuing education aspect is most acute and will warrant an immediate commitment. The program to train new media technologists could be delayed until anticipated need is firmly established. Therefore, it might be wise to develop a part-time program here. This program could help to identify the needs for new media technologists, to locate placement possibilities for them and to arrange a full-time training effort based on the lessons learned in the part-time program.

The following proposed program for such an effort in media technology includes courses taught at more than 50 per cent of the institutions which offer media technology. They include subject areas as follows:

- Communications–Theory and History
- Introduction to Instructional Media
- Equipment Operation (Instructional Media Technology)
- Equipment Repair and Maintenance
- Media Design and Production
- Media Logistics and Library Technology
- Still Photography
- Cinematography
- Broadcasting
- Graphic Arts
- Physics
- English Composition
- Social Sciences
- Supervised Fieldwork and Internship

A perusal of the program above indicates that a substantial amount of equipment and facilities is necessary to operate a successful program. One of the possible places where such a program could be implemented is the Nova Scotia Institute of Technology. It is worth noting that there is a precedent for such a program in the Maritime Provinces at Holland College of Prince Edward Island. Additional courses covering such areas as computers and society, telecommunications and communications systems should be considered as additions to the list above.

As a means of proceeding with establishing programs in media technology, the following measures are proposed for consideration by the Department of Education.

The Department of Education should authorize the Nova Scotia Institute of Technology (NSIT) to appoint a part-time coordinator of a media technical program from their current staff. This coordinator would supervise the recommendations listed below.

The Department of Education should develop certification guidelines for media technologists. In cooperation with the Civil Service Commission, the NSIT Coordinator would develop certification guidelines for media technologists so that when personnel were needed, there would be some structure under which they could be integrated into the civil service.

The Department of Education should develop a program for the continuing education of personnel working as media technologists in cooperation with Holland College, Humber College and Seneca College (in Ontario), and institutions in the United States currently involved in technical training. The first step would be to locate and marshal the expertise and facilities needed to operate a continuing education program.

The Department of Education should explore the possibility of training new media technologists. These people would have just completed high school or would be in the process of changing careers. The province should not attempt to institute a full-time program for training media technologists at this time, however.

The Department of Education, through the continuing education effort, should assist Holland College in the development of modules of instruction in the various skills related to media technologist training. These modules could then be shared by both institutions.

Resource people are becoming an indispensible part of the educational process. Many teachers would be at a loss if they had no librarian to confer with when preparing their course work, just as they are at a loss because they do not have the same type of person for planning and preparing audio-visual programs. Many teachers approached by representatives of the Nova Scotia Educational Technology Program believe that each school should have available to it a resource person to acquaint all teachers with the available audio-visual equipment, to offer expert advice, and to help teachers in minor research efforts.

People such as media technologists could perform much of the first line maintenance required to keep a machine in service. The technologists could provide instruction in the use of machines so that teachers and students could gain maximum benefit from them. By producing instructional materials

and helping in the planning of such things, the resource person would allow the teacher to devote more time to other aspects of teaching such as improving production performance in the classroom and the planning and design of new learning materials.

The properly trained media resource person can help make audio-visual machines cost-effective servants of the educational community by allowing the teacher more time to teach and by providing support in materials, design, production and implementation.

.4.6 Essential Aspects of Educational Technology for Teachers

There is wide diversity in the approaches taken in order to prepare teachers to use technology. If the Department of Education makes a commitment to bring technology into the mainstream of education in Nova Scotia, there are many problems to be solved. A basic course and/or a sequence of workshops are necessary first steps in preparing teachers to accept and use educational technology. Teachers with a specialization in technology in education and professionals trained in educational technology concepts must be developed as well. This kind of in-depth expertise is absolutely essential in order to manage the development of programs and expertise in the areas mentioned.

There must be highly qualified specialists in educational technology readily accessible to every teacher in the province. There must be resources (hardware and software) available literally on demand from teachers or students. There must be an informed administration which is committed to supporting the role of technology in education.

Finally, and most importantly, there must be a plan to use educational technology in all phases of teacher education, **in whatever form it is to be used**, for only teachers who have been taught via a given technology feel completely at home in using that technology in their own classrooms. In this way educational technology could make an important impact on the quality of the learning environment that is offered the children in Nova Scotia.

.5 Pandora's Box or a Trip Through the Looking Glass

The use of both hardware and software resources is a basic question which will engage educators for many years to come. An attempt to confront this question will be made in the next chapter. The point to be made, however, is that this use can never be fully actualized unless teachers fully understand the possibilities and the problems. Indeed, it is questionable whether tentative methods of use can be proposed without teacher input which, in turn, must be based on a sound understanding of the technology.

Many educational problems arise out of the conflict engendered when a system is imposed without ensuring that is can be understood and used properly. By now, most teachers have had several lessons on how harmful technology can be in these circumstances. By now teachers must desire a technology which is closer to them, which can be as much an extension of them, as were those first primitive tools of an earlier technology—the scroll and chalk board.

A clear concept of the important role of the teacher and the importance of resource accessibility is therefore a crucial guiding principle resting behind the measures proposed in subsequent chapters. Accessibility is a key point since an understanding of resources and a determination of their uses, benefits and weaknessess depends upon their availability for testing. Accessibility thus becomes a key to the concept of testing and evaluation. This is important, for even if a Pandora's box of irreversable changes is opened (and some argue that open accessibility would do just this) it is at least necessary to have a way of measuring what these changes actually mean.

Realistically, however, we can expect less of a Pandora's box and more of a trip like Alice's in Wonderland. The knowledge which Alice gained would not have been possible without the technology of the mirror and the opportunity given to Alice to view herself in it. In this case, accessibility was a key to her experiment, to her evaluation of her subsequent experience, and finally, to a far greater understanding of her world and her place within it.

If Alice is the teacher in this analogy, then surely she will be given the opportunity of a lifetime. The alternative to this kind of controlled access, though, is indeed a Pandora's box. As long as our surroundings are essentially forbidden to us, then we can neither understand them nor, more importantly, can we feel responsible for them. Under these circumstances there are bound to be undesirable consequences which could not possibly be predicted. This happens when people use a technology which they have not designed themselves or which they do not understand.

The alternative is to agree to test the waters of the unknown, but to agree beforehand that the test is to be on a **limited basis** and that the scope and

direction of the test is going to be controlled. This is the most likely path to ensuring success in dealing with our surroundings and with the technology which forms a part of our environment.

4 RESOURCES, CHOICES AND PROPOSALS

Whereas the previous chapter treated background principles as a means of determining future choices, the aim of this chapter is to make more concrete proposals regarding resource utilization. Thus, the specifics of both hardware and software accessibility and distribution are examined. The approach does not rely exclusively upon introducing new equipment or materials: in many cases alternative methods of organizing access to present resources, and ways of dealing with new resources when they become available, are recommended. The key to this approach is effective use of resources—new or old. The emphasis is upon a more efficient use of old resources, although increments in expenditure are considered justified if, for example, they create a greater access to learning situations.

The first part of this chapter deals with hardware and software distribution. In later sections, broadcasting and computer networks are considered. The aim is towards illuminating the potential of these systems by attempting to describe the range of applications associated with these technologies, as well as some of the constraints associated with their use and available alternatives.

The final section of this chapter describes the concept of a Coordinated Resource Service, or CORES, which is the epitome of the measures already suggested and those which follow. Thus, both background philosophy and access to material resources are included in this concept.

It should be stressed that CORES is a preliminary proposal, in keeping with the preliminary nature of this report. It is suggested that CORES, too, be piloted along with the other proposals included in this report. It is obvious that the philosophy and practical approach suggested by this report cannot be examined on a pilot project basis; yet, CORES is probably the closest we can come to testing these principles in a controlled fashion.

What is particularly appealing about CORES is that this step need not be costly; nor need it lead to any necessarily permanent changes. It is nevertheless a workable concept which has a great potential to accommodate future changes, whatever they might be, and which can realistically be considered as a viable system in its own right.

The starting point is with equipment, however, for if CORES is the organization of resources, and if teachers provide the motivation, then equipment, software, and support people are the building blocks of a complete system. When one thinks of technology, it is perhaps equipment which most readily springs to mind and is perhaps the first element

which should be clarified before discussing further measures involving educational technology.

.1 Equipment and Acquisition

Audio-visual equipment of various types, and intended for a variety of purposes, is increasing in number and value in the public schools of Nova Scotia. It is perhaps a characteristic of technology to proliferate in this fashion. It is a dangerous situation which is often difficult, if not impossible, to control. Neither teachers nor students can afford to waste their time grappling with basic mechanical problems, or with strange or inadequate equipment.

To date, no coordinated method is known to have been implemented in the province to assist in the evaluation, selection, procurement, and maintenance of hardware resources. As described in Chapter 2, although school boards purchase software and equipment, and although certain provincial funds have been allocated to assist in such purchases, the choice of software and equipment is generally decentralized to the individual schools in which it is to be used. With little information available on the suitability of equipment and with no formal standardization or coordinated purchasing policies, types and makes of equipment have multiplied. This kind of expansion has in turn led to problems of maintenance and repair, to problems in interchangeability of software, to problems in training, and to problems in establishing basic adequate levels of availability.

In order to minimize these problems, some educational authorities have used a centralized purchasing system, where a central authority (such as a Department of Education) places all, or most, software and equipment orders. By using the full buying power available through bulk purchasing, substantial discounts can often be obtained. In addition, other benefits of standardization (such as ease of repair and user instruction) are also obtained. Teachers find that this system of acquisition restricts their choice of software and equipment, often causing delays associated with centralized control of purchasing, and may result in inferior equipment being purchased, primarily to secure a large discount.

A compromise form of acquisition, termed coordinated purchasing, is a possible means of obtaining the benefits of both these forms of acquisition, while minimizing their associated problems. With coordinated purchasing, teachers select software and equipment from approved standard lists and the Department of Education then acts as their purchasing agent. The standardization thus achieved greatly facilitates maintenance and repair, simplifies training in equipment usage, and usually permits substantial discounts to be obtained through bulk purchasing. Such a system has already been implemented for software acquisition in the province. The delays often cited as a disadvantage of a centralized purchasing system can be largely overcome by designating order dates in advance.

The implementation of a coordinated purchasing system would require the part-time services of a "purchasing coordinator" within the Department of Education. It might be appropriate to locate this coordinator under the director of the Department's Public Education Grants section, since this is the section to which all budgets are submitted for approval under the present grant system. The implementation of this system also leans heavily on the availability of information services, demonstration and training facilities, and maintenance and repair services, which are part of the overall integrated systems concept.

The introduction of any changes in the existing purchasing system should take place in a phased fashion, with the first step involving the development of a standard list of audio-visual equipment by the Department of Education, through the purchasing coordinator's office and in consultation with representatives of teachers and school boards. Criteria must first be established for this standard list. Key criteria will include:

- price
- delivery
- availability of software support
- compatibility with ancillary equipment and software
- ease of operation
- resistance to inadvertent damage by unskilled operators
- durability
- ease of replacement of vulnerable components
- reliability
- availability and quality of repair and maintenance services

The development of a standard equipment list, based upon these criteria, is of course very important and should draw upon the experience of educators in Nova Scotia, national standards in the educational technology field, and the results of test reports from the federal Educational Technology Program. These test reports provide technical information on durability, ease of operation, maintenance requirements, and limitations for specific types of equipment made by specific manufacturers.

The information required for good decision-making regarding equipment is of such a nature that a provincial Department of Education would not normally have the resources needed to obtain it on its own. The purchasing coordinator's office would prepare and maintain the standard equipment list, using this information, and would make recommendations as to basic lists of equipment. This office would also provide information on, and specifications of, all available types, makes and models of audio-visual educational equipment and other evaluation information. Of course, the final choice of equipment for this list would depend upon satisfactory negotiation with suppliers regarding price, delivery, warranty and service terms.

The standard list would specify makes, types and model numbers of equipment which would qualify for incentives arranged by the Department of Education (see next section), including discounts, maintenance and repair, *etc.* To provide choice, the list should have several standard specifications for each class of equipment. This arrangement would attempt to increase the benefits of competition.

It would be necessary to coordinate this standard list of equipment with both central and regional maintenance and repair services in order to ensure that proper facilities are maintained to service this equipment. In addition, there would be follow-up evaluations of the effectiveness of equipment and media system usage by teachers. In recommended annual revisions of the standard lists, these evaluations would lead to decisions to continue or replace items; they would also provide valuable information to all educators in the province.

.1.1 Incentives

A number of incentives should be considered to encourage teachers to choose equipment from the standard list. Information and advice on the selection and applicability of equipment would be made available from the Department of Education, from regional resource services, and from educational technology resource specialists. This information would also be augmented by one or more demonstration centres to aid in instructing teachers on equipment use.

A discount could also be offered for purchases of equipment from the standard list. A set discount might even be guaranteed by the Department of Education based upon expected requirements. Under this guarantee, if fewer orders were received than anticipated (thus placing the bulk purchase in a lower discount bracket), the difference might be made up from a central pool of funds. This fund would be replenished when a greater discount was received for a larger-than-anticipated order.

In order for schools or school boards to obtain this discount, the department would have to receive their order prior to one or two pre-set order dates. The specification of order dates makes possible an elimination or reduction of delays from central ordering. When received, equipment would be delivered to schools from the department, as is now the case with group book purchases.

With a coordinated purchasing system, maintenance and repair services would be guaranteed only for equipment on the standard list (or for equipment already purchased). This would considerably simplify and improve the provision of these services. For example, a standard piece of equipment requiring extensive repairs (*i.e.* third line repair) could be replaced on a one-for-one basis. This implies that several spares would have to be obtained and held at a central point. Moreover, if any common equipment defects were to emerge, the department (with its large purchasing power) could probably influence the manufacturer to rectify them, while an individual teacher or school could not exert such an influence.

These incentives should encourage teachers to order equipment from the standard list so that bulk orders could be based on the aggregation of many local decisions. This should appeal to teachers (who would benefit from the incentives previously listed), to school boards (which would save money, and have simplified paperwork as they would deal with the department rather than with numerous suppliers), to the Department of Education (which could have more efficient maintenance, repair, instruction, production and other services), and to suppliers (who would now have a central purchasing agent to deal with).

Home and School Associations should also be encouraged in their purchase of equipment for presentation to schools to use the standard list. Otherwise, equipment would not qualify for departmental support services such as maintenance and repair.

An important consideration in the acquisition process is whether to locate the software and equipment required at the learning point or to share it on a regional basis. Because of the weight, size, and fragile nature of much equipment, it is often best left at the learning point. Nevertheless, certain expensive and seldom-used types of equipment may be held at the regional level, and be loaned out as required. A cost-benefit analysis would assist planners in determining the appropriate distribution of these resources.

A major drawback associated with the standard list might be the imposition of yet another set of standards which could, once again, remove teachers one step from control over the media they use in the classroom. **This need not be the case**, nor is it necessarily true that this disadvantage is less than the disadvantages of the present system. It is essential to organize in order to take full advantage of the technology offered. Moreover, it is still possible for teachers to participate in the recommendation process along with supervisory staff. This will tend to promote a consensus on what is good and will ensure a constant vigilance concerning the applicability and quality of equipment on the list compared to a product not on the list. This should also support a flexibility of choice so as not to unnecessarily constrain the teacher.

A special procedure would be established whereby purchases could be made outside the standard equipment list. This could be tied into a system of constant review and evaluation of the standard list so as to ensure the list did not stagnate and that the advantages of bulk discounting would not be offset by a corresponding loss of quality and variety.

This evaluation could, in turn, be tied in with service reports which could be compiled at regular intervals. In order to ensure that the teacher has not only the freedom, but the means, to argue for non-standard equipment—and to ensure that mistakes are not made—the teacher should have access to highly competent hardware experts for consultation regarding the efficacy of non-standard requests. This could be still another role for the media technologist.

While a limited choice of equipment for teachers is suggested, with orders limited to one or two ordering dates, these limitations would not be forced upon teachers. For example, if equipment was urgently needed well before the order dates, then a school board could buy individual items using the current acquisition procedure. They might lose the bulk purchase discount, but the other benefits of standardization would be received if they bought equipment on the standard list.

A considerable amount of present equipment purchasing activity in Nova Scotia is subject to various local habits or customs and, as such, will not readily follow the coordinated purchasing system suggested here. Hopefully, over time, the merits of the system proposed here will win support in these areas and a truly coordinated system will evolve. Obviously, time must be allowed for this process to unfold and, of course, the progress of the process should be monitored through some kind of evaluation.

For the moment, however, the existing cooperative purchasing procedures should be encouraged and developed with the view towards attaining a higher level of coordination than presently exists. In order to determine both what form of acquisition would be most appropriate for Nova Scotia and how best to implement this, the following is proposed.

An in-depth study should be undertaken in the area of equipment and material acquisition. Purchasing policies, funding mechanisms and other incentives should be examined with respect to their impacts on providing cost savings, on encouraging both effective equipment use and standardization, and on promoting improved use of support services.

.1.2 Maintenance and Repair

As noted earlier, the central repair service offered by the Department of Education performs remarkably well considering the scope of service and the work load. There are two pressing problems, however: (1)the repair service is overloaded by the variety of equipment, and therefore must have (or have access to) a very large stock of parts and must maintain information on a wide variety of equipment; (2)turnaround time is a problem for more distant locations, where repair expertise is seldom available, and for rarer types of equipment which the repairmen are not familiar with. An obvious solution to keeping equipment serviceable, and to simplifying the job of repair services, involves reducing the wide variety of equipment.

Since a free pick-up and delivery service for equipment is provided in the Halifax area, it is not surprising that this area makes the most extensive use of the repair service. An extension of this van service to the rest of the province cannot be shown to be economical; it is therefore suggested that extensive use be made of the commercial delivery services that now span the province. These services can provide a one-day (or at most a two-day) delivery to Halifax from any point in the province for a cost of from $3.75 to $5.00 (one way per item). These costs, in both directions, should be paid by the department in order to make the repair service equally accessible to all schools in Nova Scotia.

The central repair service should be used only for major jobs. To provide effective service at the learning point, a maintenance and repair system must carry out as much maintenance as possible at the learning point itself. The system must also provide rapid access, with a short turnaround time, to a

more comprehensive regional back-up repair service.

First-line maintenance and repair—involving replacing bulbs, cleaning, *etc.*—should be carried out locally, usually by the teacher or user of the equipment. This implies in-service training to increase the maintenance capability at the learning point, and strong back-up in terms of spare part provision and information available by telephone or from educational technology resource specialists.

Second-line maintenance and repair—involving minor electrical faults, adjustments, *etc.*—would then be carried out at the regional level, by educational technology resource specialists or by local arrangement. The pickup and delivery of the equipment could be done by vans associated with each regional resource centre; they would also serve other purposes such as delivery of software materials.

Equipment requiring major repairs and overhaul would be shipped to Halifax where the repair service would provide third-line maintenance. If the repair is to take more than a short time, a replacement of the same type of equipment should be provided. The central point could also provide for limited modification by retaining outside technical design and modification services to rectify common equipment faults as they are found, in cases where these faults cannot be successfully cleared up through recourse to the manufacturer.

The three-level system proposed here could be implemented gradually, with a corresponding growth in the level and efficiency of the maintenance and repair services provided. Indeed, since the system would make use of other elements described in this chapter, and as these will be phased in, a gradual growth seems inevitable.

One of the first improvements which could be made would involve using commercial trucking services, and advertising the availability of these services to teachers and principals. This would immediately increase the load on the two servicemen currently operating the central repair service in Halifax; further technicians and a more extensive inventory of spare parts would therefore be required, at least initially. As first- and second-line maintenance and repair grow in prominence, part of the increased load should be transferred back to the schools and regional resource services. Any further technicians hired could then be transferred to the larger resource centres.

.2 Equipment Use—Production

Once equipment is established and maintained, the focus shifts to usage. Usually, this revolves around the quality of the software available for a given piece of equipment. Software may be obtained in one of two fashions. First, it may be bought; second, you can produce the material yourself. Obviously, even though the latter course is more desirable in terms of student-teacher involvement, it is not always practical. Some subjects require special expertise to present them; some may require professional treatment for a high-quality product. Also, it is sometimes pleasing to see a production which is well done, something which a professional really does better than amateurs, or at least more consistently.

But local production is important. It is a key to effective use of the equipment and to the educational experience itself. Production may therefore include the processes which yield audio-visual materials such as films, audio tapes, duplicates of print materials, videotapes and so on. It may also be a means of providing a full understanding of the process of production, or a means of gaining motivation, or inspiration, regarding a particular subject. This applies to both the initial production and to the duplication of resources such as slides and audio and video tapes (also included are such processes as the transfer of 16mm film to videotape).

There are several factors which must be taken into account before deciding what production facilities should be available, where they should be located, who should have access to them, and how access should be arranged. One of these factors is the growing interest among teachers in developing curriculum materials to meet the particular needs of their students in developing materials which relate to their local areas.

The growing demand for school productions results from more than simple preference. There are external factors which influence the trend: available materials may not deal adequately with the topic, or may not be available at all; allocation of funds by the school board may not allow for the purchase of commercially produced materials; there may be difficulty in borrowing resources from outside services such as the audio-visual library; finally, school productions can usually be completed in a rapid and flexible fashion.

Another factor favouring school-based production is the trend towards involving students in the preparation of learning aids. Teachers using this approach view production as an integral part of the

learning experience, as is the case with writing reports. To a lesser degree, teachers are involving students in production in order to heighten familiarity with media. Some teachers take this a step further and see this approach as leading to an awareness of the uses of media in achieving social or economic goals.

This kind of development has an overall positive effect. As production facilities are decentralized and made more accessible, a diversity of benefits is obtained, ranging from involvement, to familiarity, to active learning. Depending on the circumstances, these benefits must be balanced against the loss of professional treatment which often yields a more in-depth or comprehensive approach with a higher quality product.

Equipment purchases will be required to ensure a balanced mix of local, regional, provincial, and other productions, and also to take advantage of the respective benefits of both local and professional production techniques. The priorities assigned by teachers regarding necessary equipment, as revealed in the field seminars[1], are included in Table 4-1 below.

Generally the results indicate that the ranking of production requirements correlated closely with the levels of demand for playback or projection equipment. Discrepancies can be easily explained: for example, the low number of requests for filmstrip production equipment was offset by a great many requests for filmstrip projectors; this appeared to be in anticipation of an adequate supply of commercially produced filmstrips. Slide production is also a more familiar medium to teachers and can accomplish virtually the same goals as filmstrips.

On the basis of this response from teachers, and on the basis of ETPNS assessment, a list of fundamental equipment needs was drawn up. This is included in Table 4-2 below. There are some items of production equipment so basic to teaching that they should be available in all schools; more sophisticated equipment should be available in larger elementary schools and in junior/senior high schools. This list of equipment is considered to be a minimum requirement and is proposed with the understanding that additional equipment should be available from a regional pool. Further, it is assumed that certain schools will have requirements well beyond these basic needs because of their particular approach.

Table 4-1. Teacher Ranking of Necessary Resources

Resource Produced	% of Groups choosing Items	Production Equipment	Number of Units from survey results of 526 schools
1. Stencils	100%	Thermofax Copier	240
2. Transparencies	100%	Thermofax Copier	240
3. Paper Copies	80%	Duplicator (spirit and ink)	979
4. Audio Tapes	95%	R2R or Cassette Tape recorder	2041
5. 35 mm Slides	77%	Instamatic or 35 mm Camera	70
6. Super 8 mm films	45%	Super 8 mm Camera	—
7. Video Tapes	41%	Video tape Recorder and Camera	16
8. Multi Media kits	27%	Range of equipment	—
9. Filmstrips	22%	Half frame camera	—
10. Photographs	14%	Instamatic, 35 mm or Polaroid Camera	70

This list of materials, with the appropriate equipment required to prepare them, ranked in their descending order of priority, as indicated by 22 groups of teachers at the **Field Seminars**.

Table 4-2. Basic Production Equipment to be Located in All Schools

Duplicator, Spirit	1 per school
Duplicator, Thermal	1 per school
Tape Recorder, Cassette	1 per school
Typewriter, Large type	1 per school

Additional Production Equipment For Larger Elementary Schools Of Ten Or More Rooms

Camera, Cartridge	1 per 10 rooms
Duplicator, (ink)	1 per school
V.T.R. rec/play	1 per 10 rooms

Additional Production Equipment For Junior/Senior High Schools

Camera, 35mm	1 per school
Camera, cartridge	1 per 10 rooms
Duplicator, (ink)	1 per 20 rooms
Photocopier	1 per school

.2.1 Production Equipment and Facilities at the Regional Level

The gap which exists between the equipment and software holdings at the school level and those at the provincial level proved to be one of the most serious constraints to the provision of adequate resources. The development of regionally-based systems to enable the sharing of a wide range of resources is the most suitable way of overcoming the prohibitive costs of equipping each school to the level of its actual needs.

It is significant that the consensus of teachers during the field seminars indicated that regional sharing was essential. There was a common realization that it would be obviously uneconomical and impractical not to share. Teachers' comments were not restricted to a discussion of regional sharing or of cooperation regarding resources associated with production; nevertheless, it was amply clear that teachers were strongly in favour of a regional component for all elements of educational technology. Table 4-3 illustrates the equipment or facilities required at the regional level. These figures are based on teachers' assessments and have been determined according to the software which teachers would like to produce.

Table 4-3. Facilities and Equipment of the Regional Level

Facilities:

Equipped Darkroom
Storage Space

Equipment:

Camera, video	1 per 400 students
Camera, Super 8	1 per 400 students
Editor/splicer	1 per region
Camera, 35mm	1 per 400 students
Copy Kit, professional	1 per region
Camera, instamatic	1 per 400 students
Copy Kit, small	4 per region
Tape recorder, open reel	2 per region
Tape recorder, cassette	2 per region
Printer, diazo	1 per region
Stencil cutter	1 per region
Photocopier (multiple)	1 per region
Laminator	1 per region
Videotaping equipment	1 unit per region

It is interesting to note that all of the items listed are found in varying amounts in the schools of the province. In fact, a number of regions now have all the items on the list, although these are scattered and inaccessible to the large majority of teachers in the area. These items are included at regional high schools, vocational high schools, industrial arts shops, cable T.V. stations, radio stations, universities, along with the range of production equipment held by the local schools. An important element of expertise is included here as well.

A staff person should be appointed to be responsible for the development of a regional service, which would include the kinds of production facilities outlined in Table 4-3. The term "regional service" is used rather than "regional resource centre", for there is a vital distinction between these terms which provides a basic principle for an approach. Whereas a resource centre connotes a central physical location, housing a variety of resources, a resource service may be simply an organizational network which facilitates access to resources and distribution—thereby fulfilling the same function as a centre. The essential requirement in order to free access to these resources is simply the provision of a coordination network whereby these resources can be located and used by the interested person. Not only is a centre more expensive, but there is no

guarantee that it facilitates greater access or provides a wider range of resources. This is a key element of the remedial measures being discussed in this report and will be treated in greater detail later.

This kind of sharing is important if unnecessary duplication is to be avoided; it will also help meet the undesirable situation of having a select few control the more expensive resources. If technology is to lose its sacred image and become a tool in the classroom for truly educational uses, then this concept is vital.

.3 Effective Use Of Equipment

At the present time in Nova Scotia there are over 14,000 pieces of equipment in 85% of the elementary and secondary schools, with a replacement value of about $3 million, as reported in the **Survey of Equipment and Materials**. Much of this equipment is underutilized. This section will detail some recommendations for action which will help teachers to use this equipment more effectively.

One of the main reasons given by teachers for the underutilization of audio-visual equipment is the lack of software materials. This has to be rectified before too much new money is channelled into the purchase of new equipment. Evidence from a recent survey indicates that school boards elsewhere are increasing the proportion of their dollar allotment for software materials[2]. Nova Scotia should do the same. It may not be necessary to provide more capital to undertake such an endeavour; rather, it is likely to mean a simple rechannelling of present funding to where it can do the most good.

The Department of Education should earmark a certain proportion of funds to relieve the shortage of software in the province's schools, and should formulate policies and procedures to ensure that school boards place more emphasis on the purchase of software until an adequate proportion of software to equipment is achieved.

The **Survey of Equipment and Materials** was viewed primarily as providing supportive information for several of the other projects; the data were factual as opposed to interpretive. It does not comment upon the adequacy of quantities, nor does it include any statements concerning organization, allocation or purchasing. As mentioned previously, this survey cannot be considered a complete inventory. In order to conduct a true inventory, the methodology employed would have to change. If such an inventory were desirable, a study team would be required to visit each school in the province and prepare an inventory with the help of each principal. An inventory could also be the basis for establishing a centralized file of equipment ownership or a maintenance and repair schedule.

.3.1 School Environment Needs

Many educators in the province have expressed concern regarding facilities available in the schools for the use of audio-visual resources. Seemingly minor things, such as the absence of black-out curtains—which can impair film viewing—can lead to less effective teaching media. In other cases resources are not distributed well. Some schools have an audio-visual room, for example, but in many instances there are scheduling problems since the one room may have to serve 10 to 30 classrooms.

It is not uncommon for a school to have only one display screen for six or seven projection devices. The optimum solution for this would be to ensure that each classroom in the province has a screen. However, a more practical solution, and a minimum standard, would be to have an available display screen for each projection device requiring one. This is an important area regarding funding consideration. A teacher can spend many hours preparing a professional audio-visual presentation, and indeed many do; but unless that teacher has the proper facilities for presenting such a production, the effort may well be a waste of time. The following proposals have been drafted as a preliminary means of dealing with these problems.

The Department of Education should agree to draw up a minimum standard which schools could follow in order to provide proper environmental facilities for teaching with audio-visual aids.

The Department of Education should also encourage school boards to use portions of grants presently given to them in ways which would enable schools to meet the above standard.

.3.2 Audio-Visual Services

The work done by the staff at Audio-Visual Services has been rated as excellent by teachers and administrators alike. Yet the mandate of the Audio-Visual Services section of the Department of Education encompasses more than it can adequately handle with its present staff and resources. The main problem seems to be the lack of staff; indeed, if every school in the province used their services, the staff would become overwhelmed by the

workload. Doubtless, there are other provincial government services which could complement and augment services of the Audio-Visual Services section, yet presently there is little coordination of effort.

The following is therefore proposed.

The Department of Education should review and revise the capabilities (personnel, facilities, etc.) of Audio-Visual Services and, if necessary, expand these capabilities so that the unit can properly serve the needs of education in Nova Scotia. The service should be encouraged to cooperate with other sections of the Government of Nova Scotia which might possess materials and facilities beneficial to education in the province.

This review should be conducted in light of the need to coordinate and rationalize provincial services dealing with audio-visual resources and distribution as outlined in Chapter 2. With the view to taking the first steps towards such a rationalization, the following three measures are proposed:

that the responsibilities of the Audio-Visual Instruction Activity be transferred to and subsumed by the Audio-Visual Services Activity;

that the mandate and structure of the Audio-Visual Services Activity be adjusted to accommodate the proposed changes;

that the terms of reference for ETV teachers be revised to incorporate the proposed changes and that they be made consistent with the government's policy on copyright.

It is also necessary to establish a minimum list of equipment so that a basic standard is met by all schools in the province. For example, from the table below, one can see that the equipment already in the schools does not stretch very far.

Table 4-4. Equipment To Classroom Ratio Based On A Class Average of Twenty-Five Students

Cassette tape recorders	1 per 7 rooms
Record players	1 per 4 rooms
Filmstrip viewers	1 per 64 rooms
35mm slide projectors	1 per 48 rooms
16mm movie projectors	1 per 12 rooms
Television sets	1 per 8 rooms
Listening stations	1 per 16 rooms
Videotape recorders	1 per 552 rooms

It is quite surprising to realize that such things as filmstrip viewers, which have been considered standard items for many users, are not common in the schools. The following is therefore proposed.

The Department of Education should develop a basic equipment list of audio-visual aids for schools in Nova Scotia, and the necessary funding should be made available to enable schools to purchase the items necessary to comply with the basic standard.

.3.3 Equipment Summary

The schools in the Province of Nova Scotia possess a great variety of audio-visual aids. However, some schools have very few pieces of equipment or materials. Fortunately, these schools are in the minority. Funding is necessary to bring this minority up to a basic minimum standard. Other monies which might be allocated for equipment purchase should be re-directed into areas such as software, school facilities, and Audio-Visual Services.

The proposals outlined above may be considered as a reasonable minimum. In the final analysis, however, it is not so much the resources possessed which are so important, but their usage. In fact, some of the most significant educational experiences have emerged out of situations where teachers and students have had to make do with what they had. It is important to desire something, and to be willing to obtain it through personal initiative and the cooperation of others. Yet, even though this kind of involvement can never be replaced by pieces of equipment, it is nevertheless true that a minimum of equipment is necessary to sustain the process.

Resources must be available, and people do have to develop not only a spirit, but a means, to share them. This is true not only of equipment, but of the materials which run on this equipment as well. The next section treats this crucial concern.

.4 Software Access

The key to the solution of the problem of resource-sharing and resource-accessibility lies in determining the means by which resources are distributed. Software distribution relies on both the physical distribution of resources and the electronic distribution of resources. The field of electronic distribution is now on the leading edge of technological development; therefore, in a sense, it holds most promise in the years to come—if we can learn from the mistakes of the past and build our new systems accordingly.

The key elements associated with these emerging systems are treated in the next section, but the kind of physical distribution structure developed with existing technology will be a primary factor in the method by which emerging technology is handled. Present methods are the underlying structure of future development and are critical in that they must be dealt with immediately before any further steps are taken.

The consensus emerging out of the teacher seminars and surveys conducted in the Initial Phase of the ETPNS indicated that current software holdings are misallocated. Centralized services, film distribution in particular, have been severely criticized as being totally inadequate in order to meet existing demand. There is no obvious solution to this problem.

Decentralizing a service might possibly succeed, but the cost of such a move could prove prohibitive or seriously cut into allocations of funds in other critical areas. It is apparent that decentralization cannot be viewed as the panacea for the ills of centralization, and *vice versa*.

In attempting to strike a balance between easy availability (having many copies) and high costs (producing many copies), it is necessary to consider how much software is required in total (to ensure an adequate overall supply) and how best to distribute the material. The term distribution is used here in two senses, referring to both static placement and dynamic movement; both forms of distribution must be considered for software to be made available to teachers and learners.

It is axiomatic that software which is curriculum-based and is heavily used on a day-to-day basis in the classroom and school media centre should be located in the school, and in many cases should remain in the classroom. Such materials will include filmstrips, audio tapes and records, slides, transparencies, film loops, *etc.*

When software is more expensive (such as 16mm film and videotape) and/or not frequently used, and where schools are too small to warrant having items permanently on hand, a regional location is the best solution. Materials are then either pooled for distribution or remain fixed for common access using the regional service's own viewing equipment. This implies a three-level system involving local (or school) media resource services, a central distribution point, and an intermediate level of regional resource services. Of course, once one locates expertise, material and equipment regionally, other functions such as information retrieval, production, training, maintenance and repair, are also appropriately located there. Thus, the three-level resource service, described in the final section of this chapter, can be considered to stem from and be influenced by the consideration of software accessibility.

.4.1 Overall Provincial Software Requirement

The current situation in Nova Scotia in terms of software and materials has already been described. The inventory of Super 8 film loops (silent), filmstrips, audio tape and records, slides, transparencies, 16mm film and videotape is as tabulated below. Based upon estimated average replacement costs of commercial materials, an overall replacement value (in 1975 dollars) of some $1.2 million is estimated.

Table 4-5. Inventory of Software

Medium	Cost/Item ($)	Inventory	Value ($000)
Super 8 Film Loop(Silent)	25	188	5
Filmstrips	6	25,550	153
Audio Tapes and Records	5	13,610	58
Slides	.50	8,835	4
Transparencies	.50	16,722	8
16mm Film	200	4,700	940
Videotape	50	–	–
Total			1,168

There are also locally produced materials (such as silent Super 8 film loops, filmstrips, audio tapes, slides and transparencies) which might have a replacement value of about $0.25 million; these would not be as useful as the commercial material, however. A rough estimate of the total value of all these resources, in and directly available to Nova Scotia schools, is about $1.5 million.

While this appears to be a substantial amount, it can be argued that far more software material should be available. The question "How much?" is difficult to answer, however, especially since audio-visual experts have widely differing opinions.

The recommended levels given below are based on standards suggested by the Ontario Teachers Federation[3] and by the American Library Association[4]. These levels are not definitive and should be used only as guides as to whether Nova Scotia schools should have similar levels of materials available to them, and as guides as to whether the inventory of equipment is in line with the inventory of software materials (summarized below). These recommended (minimum) levels, for schools of about 250 students, are discussed below in terms of the following media:

- Super 8 Film (sound and silent)
- Super 8 Film Loops (silent)

- Filmstrips
- Audio Tape and Records
- Slides
- Transparencies
- 16mm Film
- Videotape

Super 8 Film (sound and silent)—Regular length Super 8mm sound film is not recommended since much of the demand for Super 8 film is met by the existing 16mm film library. Commercial Super 8 film is not significantly cheaper than 16mm film; furthermore, there is not a large catalogue of material available. There may be special applications for which Super 8 sound is justifiable, however, and these should be examined on their own merits.

Silent Super 8 is quite valuable for local production. The level of expenditure required is highly dependent on local demand, however, and cannot be specified in general. Moreover, the majority of media specialists seem to favour videotape, which permits much faster production since there is no processing delay.

Super 8 Film Loops (silent)—The most common application of Super 8 silent film loops, for individual or small group use, is for short, single-concept films used for the communication of difficult ideas. This has proven to be a popular medium with younger students, especially for individual use. Costs tend to run about $20-$30 per loop. The availability of a library of at least 500 different titles is recommended in most standard lists, with an appropriate number of copies, depending on whether the film is for individual or class use.

Filmstrips—This is another medium which is very popular with younger students for individual learning, as well as for teacher-controlled and teacher-directed activity in the class. One difference is the cost: roughly $6 for a colour strip and $4.50 for black and white. Availability of a library of at least 500 titles with appropriate copies is recommended.

Audio Tape and Records—Recommended library levels for records and tapes vary widely according to the source. It is suggested that a library of at least 500 record and/or tape titles be made available. Costs range from $3 to $6 (averaging $5) per item.

Slides—Availability of a library of at least 2000 slides is recommended. Costs for this medium tend to be about 50 cents per slide, with local production costs of 20-30 cents per slide.

Transparencies—A library of at least 2000 professional transparencies should be available; costs are in the order of 50 cents per transparency.

16mm film—A locally-accessible library of at least 3000 titles should be available to each school, with rentals or borrowing from other sources additional to this. Since costs range from $180 to $250 (averaging $200) for a 20 minute film, it would be prohibitively expensive to locate these films in each school.

Videotape—The availability and size of a videotape library will depend on the extent of provincial television production, on the purchase of commercial videotape material, and on any replacement of 16mm film by such material.

Recommended levels and average costs are summarized for these media, excluding 16mm and videotape, in Table 4-6. It appears that the cost of providing a library of the recommended level for each medium varies considerably. The 16mm and videotape libraries, if only for the sake of economy, must be considered as resources which will be available at the regional or provincial level; these media are discussed in the next section.

Because of the small size and low unit cost of the remaining media—Super 8 film loops, filmstrips, audio tapes and records, slides and transparencies—these should be considered primarily as school (or individual) media available in the school library or local media resource service. The recommended levels given are for schools of about 250 students.

To estimate the requirements for all Nova Scotian schools, it is assumed that the recommended (minimum) list for a school of 250 students is in fact a requirement for schools of 200 students or more; *i.e.* every school with more than 10 classrooms should have at least these levels.

In the case of schools smaller than 250 students, such levels would represent more than a minimum requirement; however, very large schools will certainly require more than the minimum. There are about 335 schools in Nova Scotia with more than 10 classrooms each.

The remaining schools in Nova Scotia—some 275 in number—have fewer than 10 classrooms each; it is assumed that these smaller schools have on average about 5 classrooms each, or 100 students per school. Thus, these 275 schools represent about 27,000 students, which is equivalent to 100 schools of 250-275 students each.

It is now assumed for simplicity that the media

Table 4-6. Media Resource Requirements

Medium	Recommended Library (Number of Titles)	Cost Per Item	Total Cost Per Library[1]	Number of Libraries[2]		Total Cost	Value of Current Inventory	Cost Difference
		$	$	E-S	L	($000)	($000)	($000)
Super 8 Film Loop (silent)	500	25	12,500	335	100	5,438	5	5,433
Filmstrips	500	6	3,000	335	100	1,305	153	1,152
Audio Tape and Records	500	5	2,500	335	100	1,088	58	1,030
Slides	2,000	.50	1,000	335	100	435	4	431
Transparencies	2,000	.50	1,000	335	100	435	8	427
Totals	—	—	**20,000**[1]	—	—	**8,701**	**228**	**8,473**

1. Cost of a library for a school of 250 students.
2. E-S: elementary and secondary school libraries; L: local pools for the other 275 schools; 20 pools with 5 libraries/pool

resources for these schools could be placed in 20 local pools, each with five collections of the recommended levels, giving 100 recommended level collections. These could then be shared among the 275 smaller schools, and the resources they share would be roughly equivalent to those suggested for the larger schools.

The methods of sharing would have to be worked out on a local basis; it might be found that semi-permanent loans in one part of the local library collection, together with a regular rotation of other parts, would be a suitable arrangement. However this might be, the suggested allocation provides resources on an equitable basis with the larger schools.

The fifth column of Table 4-6 summarizes the number of recommended library collections required: 335 for each school of more than 10 classrooms, with 100 shared in 20 local centres for the 275 smaller schools. The total cost of acquiring these 435 collections is calculated in the sixth column, giving $8.7 million. This would have to be spent to bring inventories up to the recommended levels.

Locally produced materials are not included in this calculation. This is not to say that these are not important—far from it; however, their relative importance will be determined by the skill, enthusiasm, and training of individual teachers. They are also useful tools of teacher education in their own right. Nevertheless, teachers should not be deprived of professional material such as that available from departmental productions (such as museum kits) and all other private and public sources which sell or rent material. It is also noteworthy that 16mm film and videotape requirements have not been included here since these are so dependent upon the distribution system used.

Table 4-6 indicates that the replacement cost of current software holdings in Nova Scotia schools is only about $228,000, some 2.6% of the value of the recommended level of software($8.7 million). As noted above, these amounts are only estimates, to be regarded as guides. What they do indicate is that the amount of software available in the province is much lower than might be expected. Moreover, the analysis of equipment shows that current equipment holdings in the province are about 25% of the recommended levels being used as a guide here.

Even with the uncertainties inherent in these numbers, it is clear that there is misallocation between equipment and resource material levels. The numbers suggest that present equipment could

effectively utilize up to 10 times the current amount of software. It is therefore recommended that priority be given to the acquisition of resource material before a major procurement of additional equipment is undertaken. Naturally, schools low in both materials and equipment will require both.

Several possible explanations can be suggested for this imbalance between equipment and material resource holdings. Equipment has generally been purchased out of the capital budget at the time of a school's construction, but current software materials must be purchased out of the very limited instructional budget. It is therefore suggested that:

budgets should be made sufficient, and more budgetary flexibility should be allowed, so that software purchases can be made appropriate to equipment purchases.

Another explanation for the imbalance between equipment and material resource holdings is that insufficient teacher and administrative training has led to a lack of awareness of what constitutes appropriate expenditure levels on resource material relative to equipment. The following is therefore suggested.

Consideration should be given to extensive in-service and other training courses to ensure that teachers are made aware of the proper mix of equipment and media resource material as well as administrative procedures. Consideration should also be given to having mandatory preservice courses in educational technology.

Once again the question of teacher education is central to the measures proposed here. A further opportunity for teacher training would be provided through the following measure:

establishment of a model regional resource service in Colchester-East Hants school district, for training of students of the Nova Scotia Teachers College in the use of educational technology in an operational setting.

Two further grants adjustments may be proposed as a means of increasing software accessibility to Nova Scotia teachers. The first involves the newly introduced Credit Allocation System for obtaining authorized teaching/learning materials from the School Book Bureau. It is proposed that:

the Credit Allocation System should be expanded to include a wider range of learning materials, particularly non-print media.

A second measure involves the Instructional Materials Grant, commonly referred to as the "library grant". Under this grant, school boards are able to obtain cost sharing from the Department of Education for materials up to $2.00 per pupil. It is proposed that:

the Department of Education should increase its cost-sharing arrangement in the Instructional Materials Grant from $2.00 per pupil per year to $3.25 per pupil per year.

Suggesting levels for software materials, as above, immediately invites questions regarding the justification for such expenditures and whether the suggested standards are appropriate. It is also possible that funds could be more effectively spent elsewhere.

An absolute answer to the question of the relative effectiveness of audio-visual compared to other resources is impossible. Teachers and administrators who are confident that the technologies discussed in this report are effective will call for immediate implementation. Others, thinking perhaps that such money might be spent more effectively on new schools or teacher retraining programs, will ask for further studies. Such divergent opinions are to be expected since, in a complex activity such as education, it is never entirely clear how effective one resource is compared with another in contributing to objectives. Ideally, the relative effectiveness of different resources would be measured over a period of ten to twenty years. In practice, however, it is impossible to control the many outside factors which can alter the outcome of such a study. The solution seems to be to follow the model established earlier of balancing more studies against immediate implementations by way of small steps and periodic evaluations.

In examining this problem, it can be noted that the levels suggested above have been found appropriate by many educators; it is believed that such standards are also generally appropriate to Nova Scotia. Differences and modifications can be introduced as sophistication in handling these resources increases.

At a minimum it is proposed that funds be allocated, and software materials be purchased, in line with equipment holdings. Further resource materials should then be acquired as needed. The priorities which should be established concerning equipment are therefore as follows.

First priority should be given to the immediate acquisition of appropriate media resource materials.

Second priority should be given to acquisition of further equipment and resource materials as determined by teachers in consultation with media resource specialists.

The following seems a reasonable range of display equipment which should be made available to complement software holdings. These quotas have been established on the same basis as the determination of software levels.

Table 4-7. Basic Display Equipment for All Schools

Cassette Tape Recorder	1 per room
16mm Projector	1 per school
35mm Slide Projector	1 per school
Overhead Projector	1 per school
Filmstrip Previewer	1 per school
Record Player	1 per 2 rooms
Portable Screens	1 per room
Blackout Curtains	1 per 5 rooms

Additions For All Schools of at Least 10 Rooms

16mm Projector	1 per 10 rooms
35mm Slide Projector	1 per 10 rooms
Overhead Projector	1 per 5 rooms
Filmstrip Previewer	1 per room
Filmstrip Projector	1 per 10 rooms
V.T.R Record/Playback	1 per 10 rooms
Super 8 projector	1 per school
Listening Station	1 per 5 rooms
Video Monitor/Receiver	1 per 3 rooms

.5 16mm Film and Videotape

At present there is a 16mm film library in Halifax of some 5000 film prints; there are also about 100 films in schools. The central library has been criticized by teachers for its inability to meet their demands. Analysis of film requests indicated that only 17% of requests were turned down, implying that the central service is adequate. This statistic gives a distorted picture of film demand, however; many teachers have given up requesting films as a result of failures to obtain them in the past. Moreover, an analysis of the demand for the 100 most-requested films (as opposed to all films) indicates that these films are as likely as not to be unavailable.

In comparison with what is considered appropriate in other provinces, a central library of 5000 prints does not appear to be adequate. Making a comparison between provinces is, of course difficult, since some have centralized systems while others have decentralized operations. It is possible, however, to compare the overall availability of film in general terms between two provinces, such as Nova Scotia and British Columbia. In 1972, there were libraries with a total of some 37,200 films serving the B.C. population, which is about three times that of Nova Scotia (on a *per capita* basis).

Assuming that British Columbia does not have an over-abundance of films, this indicates that about 12,400 films would be required in Nova Scotia, rather than the total of 5,336 now available as of March 1975, in order to bring levels up to those in British Columbia. This simple analysis suggests that Nova Scotia has only 40% of the 16mm films which might be expected in comparison with British Columbia. Even allowing for extreme differences of standards and procedures in British Columbia (for example, their system is more decentralized) Nova Scotia still falls short of what could be expected.

The extent of utilization of films is also highly dependent upon the distribution system employed. For example, teachers in Halifax-Dartmouth, who are served by a van from the provincial film library, use film twice as much as other teachers in the province. Obviously, the very existence and reliability of this service stimulates usage of the film library.

Thus a film library serving a region via a van apparently results in a much more effective distribution of the medium. It therefore seems reasonable to put small 16mm film libraries in regional centres and supply a van, so that usage can be increased. It would seem to be inequitable not to provide the same level of service to all teachers. How to achieve this at minimum cost is a difficult question which has not been resolved here. Nevertheless, three options (or combinations of them) can be considered: create regional libraries and van services; augment the central film operation; use videotape instead of film.

The first option is fairly expensive. A library of 1000 films would cost about $200,000 to purchase and the cost of a van, driver and staff at the regional service can cost as much as $32,000 per year. This alternative would appear to be the most effective, however.

The second option, of increasing the central film library, may be a reasonable alternative. The present staff of two must process 200-400 films a day, so at busy times they cannot get films "turned around" in one day. Typically a film may spend one to four days in the library before it can go out again.

An automated booking system reduces the additional staff required since it can lead to greater staff productivity and faster film turnaround. It also appears that there are not enough copies of the highly-demanded films; these could be increased to make the present library more effective. In summary, either staff additions, or automation (perhaps with staff transfers), coupled with more film copies appear to be necessary.

A third option is to distribute videotape instead of 16mm film, since videotape is cheaper and therefore allows more effective coverage for the same price. This is a complex issue, one which requires further study and analysis.

At this point it is worth noting that 16mm film and videotape may have quite different levels of effectiveness in different educational applications. Since the suitability of one or the other medium depends on subject and content, they are not strictly comparable. Indeed, the two media can be regarded as both complements and substitutes; their application should therefore be the outcome of careful curriculum planning. The transfer of material produced on one medium to the other is fraught with difficulties. However, recent technical advances (by Goldmark Laboratories, for example) may permit some film to be transferred to videotape with minimal loss of effectiveness; further developments are expected in this very rapidly changing field. Without considering the issue of effectiveness further, we examine the relative costs of 16mm film and videotape.

Estimates of production or copy costs per showing, for 160 showings per year, of 16mm film and videotape are coupled below with estimates of equipment costs per showing, for 320 showings per year of film projectors and of VTR-monitor sets. The total costs (for production or copy and equipment) per showing are broken down according to type of material involved.

Type of material	16mm Film	Videotape
Integrated curriculum	$25.60	$ 7.60
Provincial	$ 8.10	$ 3.35
Commercial	$ 3.90	$ 2.80

These estimates suggest that videotape is always cheaper, although the saving is not as significant with commercial material. On this basis, it is tempting to conclude that videotape is a clear winner on a cost basis. The analysis does not take account of current holdings in equipment and resource material, however, and this can radically influence the result. It is therefore necessary to consider the incremental costs involved in modifying the current system.

Nova Scotia has six hundred 16mm film projectors, or 1 per school on average. There are few videotape recorders in the schools, so that for all practical purposes, the province has a "pure" film system. Since the above analysis shows that on a cost basis, videotape is distinctly cheaper, it would be preferable to introduce a videotape-only system if there were no inventory of 16mm film and film projectors[6]. Since this is not the case, it is necessary to consider the following options (or combination of them) in order to improve the availability of film/videotape within the province:

- augment the film system (film option)
- purchase a videotape system (videotape option)

The first option has certain attractions: film usage is well established; entry into videotape technology has administrative difficulties (such as choosing a standard format, new maintenance services required, and new training needed); and there would also be hidden costs. Since there is relatively less software available than equipment, in augmenting the film system one would purchase additional film copies before projection equipment. However, film copies are the most expensive component of a film system. Purchasing a videotape system, on the other hand, would involve purchasing a number of video players in addition to the videotape copies required.

In order to compare these two options, let us consider a hypothetical film library of 5,000 different titles, of which 20% are in high demand (requiring five additional copies each) while the remainder have moderate demand so that one copy is sufficient. It is assumed that those films in moderate demand are actually distributed and projected. The comparison of film and videotape is based on a six year comparison (adjusted according to the degree of demand for material).

With the **film option**, five copies of 1000 existing films would be purchased for $1 million; after three years, six new copies of each would be purchased to replace these at a cost of $1.2 million. No additional projectors would be required to show these new acquisitions. With the **videotape option**, on the other hand, six videotapes of the top 1000 films are purchased for $.3 million, with the

same expense incurred three years later. In addition, some 600 video players would be required to show these; the capital cost is $0.9 million, with an amortized annual cost (including repair) of $0.25 million. It is further assumed that the existing television receivers in the province can be adapted for use with the video players, at a cost of $50 per receiver, for a total cost of $30,000, or $6,000 per year.

Over six years these cost estimates indicate a film copy cost of some $0.36 million on average per year for the film option, compared to a videotape option cost for video players, receiver modifications and videotape copies of $0.35 million per year. It is apparent that annual costs are very similar, because the lower videotape costs are offset by the expensive equipment required.

What are the important limitations of this cost comparison? First, it is assumed that present television receivers can be utilized and need only be modified at low cost. This may not be a valid assumption, since many of the receivers are old and may not last six years of heavy usage. Furthermore, colour televisions are virtually non-existent in provincial schools and these may be required. If these assumptions are not valid, the effect is to increase the videotape option cost through the acquisition of new colour monitors. The capital cost for 600 colour monitors would be $0.42 million, with a yearly amortized cost of $0.105 million; this is the amount by which the annual cost of the videotape option would be increased. At the end of six years a new analysis would be required since it is likely that equipment for both film and videotape viewing would have to be replaced.

This comparison does not include such intangible considerations as the relative pedagogical appeal of these media, either in terms of their effectiveness as teaching instruments or in terms of the result of their exposure in the classroom. Such related questions as the relationship between distribution and production also need consideration. Videotape is more suited to local production, has an immediate playback feature, is easier to learn to use and has reusable stock compared to 16mm film. In terms of accessibility and ease of immediate use, videotape is clearly superior to 16mm, given the current state-of-the-art.

The videotape option also results in users having access to other than just film-based material. Since a variety of media, from slides to film, can be transferred easily to videotape, significant cost advantages can accrue to a videotape system owing to the rationalization of production and software maintenance this step would entail. With the acquisition of video players and possibly new monitors, the department's current ETV library could also experience a surge in demand since teachers would now be able to schedule the showing of this material at their convenience. The preparation of local, regional and provincial videotape material might also be stimulated for this reason. Costs of the two options are not now comparable, since under the videotape option there may be a significant increase in usage; this option is then more cost-effective, since for about the same increment in cost there is a proportionately greater increase in use.

These comments indicate that distribution cannot be considered simply in isolation from such other factors as production or preference in considering whether 16mm film or videotape is the more cost-effective option. The point is that the costs are very sensitive to demand assumptions, duplicating costs, and other considerations. A balanced argument might conclude that, in spite of the considerable difference in cost of software, videotape is not much cheaper than film when one is considering a film/videotape library operation, since equipment and operating costs for videotape are significantly higher. However, when considering a broader range of educational purposes, the videotape medium seems more economical since it allows standardization within one medium and provides for a greater variety of applications. From this analysis the following is proposed.

The introduction of videotape into the province should be given serious consideration, not so much on a cost basis but for the opportunities it allows in local, regional and provincial production, and the flexibility it gives to present non-film-based material in a wider variety of teaching situations.

The discussion so far has been concerned with using videotape instead of film. We now return to consider the augmentation of the central film operation. The justification for retaining and even increasing film is three-fold: on an incremental cost basis it is comparable to videotape; there are not sufficient quantities of up-to-date film available to make good use of the present projectors; and for learning effectiveness, there will be some subjects which cannot be shown effectively on television. The following is therefore recommended.

The film library should be retained and expanded, with attention given to subject

and content areas which are most effectively presented in this medium.

The augmentation of the film library implies that more copies of popular films must be purchased; new films directly related to curriculum must be evaluated and purchased to replace those that are outdated; additional staff must be hired to reduce the turnaround time for films; and an up-to-date catalogue should be published by the Department of Education giving reviews of films.

Another means of making films available in Nova Scotia involves making it easier for teachers to obtain films from outside sources such as the National Film Board and the Canadian Film Institute in Ottawa. This might involve the Department of Education paying the rental costs for films from organizations such as the Canadian Film Institute, and paying postage costs (averaging $1.50 to $2.00 per film) for the return of all films, as is now done for the department-owned films. A further means of increasing utilization of film involves reducing the delays occurring in circulating films.

Delays in turnaround within the film library will be reduced through having additional staff, as suggested above. Other sources of delays occur in transit via the Post Office and in the schools. A study should be undertaken to determine how any such delays could be reduced.

It is expected that these improvements to the central distribution of 16mm film will make the service more effective. An alternative approach to improving the service involves the option of creating regional coordinated booking arrangements. In order to investigate this option in more detail, it is suggested that an experimental regional coordinated booking service should be established as a pilot study. A van (as part of the service) could be used to move equipment and media resources to and from the regional services. This would provide a test of the usefulness of such a van service. The following is therefore proposed.

A coordinated booking service should be established complete with a van service. This service would provide for distribution of films as well as other media and equipment.

It is apparent that a combination of all three options is recommended: a coordinated booking service, augmenting the central film operation, and using videotape. Additional studies, to be undertaken during the proposed Phase II of the ETPNS program, will further clarify the situation in terms of 16mm film and videotape by collecting better demand and cost data, and by comparing the effectiveness of the two media in various learning situations. Another area to be studied at that time is the use of cable television for the local distribution of programs recorded on 16mm film and videotape.

.6 Electronic Networks—Broadcasting

The public view of educational technology is perhaps best characterized by radio, television and other telecommunications networks. Networks are basically communications systems used to send audio or visual messages from one point to another; they have great educational capabilities and have been used this way for several decades. What is perhaps most exciting about these technologies is that they are still in a developing stage. The combination of new technologies, such as the pairing of television with satellite or microwave transmission facilities, can evoke entirely new developments. Cable television is one such development emerging out of this kind of combination.

But just as broadcasting networks are immensely flexible, so too are they costly to implement. This is an important consideration with regard to such questions as whether Nova Scotia is to have a film or video distribution network and whether this network is to be a centralized or decentralized one.

On the surface, a video distribution network would seem more compatible with emerging cable television technology. In order for this assumption to be tested and implemented, however, the underlying philosophy of the educational system must be sufficiently defined so as to enable decision-making to take place along clear-cut lines. This is critical; since these systems are still in a state of development they can still be moulded; however, once they are established, the capital expenditure is likely to be too great to accommodate radical changes. The role of this report is to begin this process of defining needs and suggesting systems to meet these needs.

Several types of video networks are examined below. These may be classified according to the following typology.

Classification of Networks

Video

Over-the-air television broadcasting
Satellite television broadcasting
Instructional television fixed stations
Cable television (CATV)
Closed circuit television (CCTV)
Video tape recorder/players*
Video film players*
Video disc players*

Audio

Radio broadcasting
Subsidiary carrier authorization FM radio (SCA)
Audio tape recorder/players*

Voice and Picture (Narrowband Audio-Visual)

Telephone
Electronic blackboard
Facsimile
Slow-scan television

Computers and Data

Telex/TWX
Computer communications

Note: * indicates players and recorder/players which, while not strictly part of networks, can be considered as network terminals.

These networks are considered here under the headings of television broadcasting, cable television, radio broadcasting, and communications services. A later section considers computing and computer communications.

.6.1 Video

Video signals can be distributed for educational purposes using various distribution channels or networks. These networks form the building blocks through which educational television can be made available to schools and individual learners throughout the province.

Specific systems are not easily determined, since the optimal configuration depends upon different distribution channels which can be established only according to given sets of requirements and in relation to a given situation. The educational requirements of the province for video have not been firmly set. This choice will involve a lengthy process of defining needs, piloting and evaluating systems, resulting in a definition of new needs and systems and so forth. Yet this choice may be approached here in a preliminary fashion.

Educational programs aimed at large and geographically dispersed audiences are usually provided via over-the-air broadcasting systems such as the CBC network. This network is suitable for providing a wide range of educational opportunities although, in practice, its application is more limited. The limitations are easily explained: a single television channel may not respond adequately to the diverse needs of the educational community; the scheduling of transmitting times for educational programming places constraints on teachers; and, as the television network is presently structured, repetition of programs is often difficult.

Recognizing these limitations, it might be appropriate to delete some programs and transfer other current educational programs to other network facilities as described below. Released air time could then be used for programs of more general educational interest which are least affected by these constraints. Alternatively, the Department of Education should undertake further studies, and enter into negotiations with the CBC, in order to identify the role the CBC should play in future production and distribution.

Other video transmission systems which might be appropriate for the province include: low power VHF (very high frequency) or UHF (ultra-high frequency) transmitters; instructional television fixed stations (ITFS); closed circuit television (CCTV) systems, and cable television (CATV) systems.

.6.2 UHF and VHF

Another form of over-the-air broadcasting, aimed at a variety of audiences, may utilize a specialized educational channel operating at a different frequency than normal transmissions. A VHF or UHF network serving the entire province could be created similar to those currently employed in Ontario by the Ontario Educational Communications Authority and in Québec by Radio-Québec.

A number of low power (5 watts or less) VHF stations are currently in operation in smaller communities in Nova Scotia *e.g.* Mabou, Margaree, Pleasant Bay. It is worth noting that these low power stations operate on unprotected channels: if the operation of such a station causes interference to

existing television stations, it can be closed down if another suitable channel cannot be used. Such low power local television stations might be suitable to deliver educational programs. For example, low power transmitters have been used with success by the Alaska Educational Broadcasting Commission in three small rural communities in Alaska (with a combined population of about 1,300). The mini TV transmitters used are modified to accept a signal from a video cassette player, and are capable of transmitting within a radius of five miles. Educational programs are available through videotape cassettes sent by mail to the communities; locally produced programs also form part of the stations' programming.

Although most VHF channels are presently in use for other non-educational purposes, a great number of UHF channels are available for educational use throughout the province. These UHF channels were allocated on the basis of population centres: one channel for populations between 1,000 and 10,000 and two channels for populations between 10,000 and 20,000. Furthermore, virtually all new colour television sets are equipped with a UHF receiver built in. This capacity is presently not being utilized.

Even though these UHF channels are available, and even though individual broadcasters can be established very inexpensively, it should be noted that a large investment would be required to establish an educational television broadcast network. In addition, the application of this technology is still at an early stage of development. Thus, the Department of Education should define its educational television policy, and this must then be followed by a close study of a number of alternative television delivery systems.

.6.3 Instructional Television Fixed Stations

Instructional television fixed stations (ITFS), also known as "narrowcast" systems, address themselves to limited audiences. Considerable scheduling flexibility is made available, since up to four different television channels can be transmitted simultaneously to schools within the short range of their low power transmitters.

This flexibility enables teachers to request the transmission of a specific program available on videotape at convenient times; voice and data can also be transmitted. Because of the high frequency band (2500 Mhz) used by an ITFS system, programs can be received only via special hardware, which restricts the reception of programs to schools with the necessary equipment.

The advantages of ITFS are that it costs less than commercial television; moreover, voice interaction between student and teacher is possible with additional equipment. Limitations are that the number of television channels is currently limited to four (by regulation of the federal Department of Communications) and that, with low transmitter power, coverage is limited to about 10 miles.

ITFS is widely used in the United States. There are also several examples of successful ITFS systems in Canada. The best known Canadian system is used by the London Board of Education, which services 26 schools. The operating costs per year for an ITFS system for the provision of four channels to schools are in general lower than for a VHF/UHF or cable television system.

.6.4 Closed Circuit Television

Another option, which is extensively used in Canada, involves the installation of closed circuit television (CCTV) systems. These are technically similar to cable television systems, but serve a much smaller geographical area: they are usually confined to a single building or a set of buildings in the same area. Since these can simultaneously transmit more than 12 programs, further scheduling flexibility is made available as multiple programs can be sent to different classrooms in several buildings.

The choice of an optimal approach to providing video transmission in Nova Scotia is obviously very complex, and requires considerable further study. This is especially important in light of the high expense involved in installing network systems and in providing operating studios. In addition to extensive technical and economic studies comparing and evaluating different types of video network systems, it is particularly important that educational requirements for video networks be determined. It is therefore proposed that:

the role of video network facilities in the educational process should be studied in detail.

This study should be undertaken during the course of the proposed Phase II, outlined in the final chapter.

.6.5 Videotape Recorder/Players

While video networks may be required, the alternative means of delivering video signals to the learning point involves the videotape recorder/playback systems mentioned in Section 4.5 on software distribution. These devices are also very important

in any well-run video network with video players in the studio and with videotape recorder/players at the reception points. The distribution of videotape has already been examined; here the concern is with alternative devices as sources of video material.

Videotape recorder/players can record and replay an image immediately. Their ability to store a video picture overcomes the major problem of scheduling video programming. The technology is limited by a large number of different tape formats, and incompatibility between tape recorders of different formats. Moreover, without preprogrammed tapes, original production costs can be high for a fully equipped studio (although inexpensive productions are possible with portable equipment).

Video film players enable Super 8 film as well as videotape to be displayed on a television receiver or distributed through a closed circuit television system to a large number of TV sets. This has the advantage of enabling the potential magnitude of an audience for a film to be considerably increased. However, as noted, elaborate production facilities and considerable expertise are still required to obtain a high quality educational film.

Video disc players resemble gramophone record players with the addition of a connection to the television set. The outstanding potential of the disc lies in its low unit cost for large production runs. Moreover, in some models, picture quality is not affected by rough handling, finger prints and dust; these discs also have a random-access feature enabling instant visual access to key sequences in the presentation.

Limitations of video discs are that: the playing time with present techniques seems to be around 30 minutes; no standards have yet been agreed upon; production of video discs requires expensive equipment and therefore cannot presently be done locally; a large quantity of copies is needed to amortize the cost of the expensive original master copies; and there is a shortage of relevant educational programs for disc production. Technical support for some models of the video disc, using laser technology, is also uncertain on a mass production basis. Video discs are scheduled primarily for the consumer market, with introduction in the U.S.A. projected for the last quarter of 1976. Valuable though this technology may be, it cannot yet be considered as a viable alternative to the other video equipment discussed above for at least the next three years and until a suitable library of educational programs becomes available.

Of these three technologies, only the videotape recorder/player offers the advantages of recording, playback, and extensive "hands-on" user experience. However, the expense of entering the videotape field in a systematic fashion would be considerable. In order to familiarize educators with the potential of videotape recorder/players, and to determine the educational needs through actual use and experience. The following is therefore proposed.

A pilot project should be set up, with a limited number of videotape recorder/players located in schools and regional resource services, to investigate the role which they can play in increasing the availability of video material to the learning process.

A close watch should be kept on the emerging technology of videodiscs for future potential use in the educational sector.

.7 Cable Television

The strongest feature of cable television is its versatility, reliability and high channel capacity, enabling programs of regional or local interest, and specialized programs, to be aimed at small audiences. Cable television could also be of considerable value for the distribution to schools and communities of programs on film or on videotape.

The most up-to-date cable systems carry more than 20 television channels, while some can transmit in both directions, providing for some form of response from subscribers or program origination from subscribers. While the development of bi-directional systems as a standard procedure may be years away, they have obvious advantages of making feedback possible during the learning process and enabling program transmission on a demand basis. There are presently a number of outstanding applications for cable licenses in Nova Scotia; if these are approved, then conceivably 70% of the province's school population could be serviced under existing cable arrangements.

Audio-visual programs produced in one school or regional location could easily be transmitted via cable lines to the cable head-end for distribution to other schools in the same community. Programs can also be repeated at convenient times, allowing much more flexibility in scheduling. By making possible local origination, cable television encourages a decentralization of the production of video educational programs, and the educational experience acquired in this way could be of considerable

value. Moreover, where professional products seem desirable, and where they can be justified in terms of cost, then the existence of a cable network provides the basis for undertaking this kind of production as well.

In the United States the industry's aim is to make the systems responsive to public needs. Various interest groups have been able to make their influence felt by gaining access to existing systems or by forcing the inclusion of public access provisions in the franchises of cable systems which are just getting under way. In Canada this is the current policy of the CRTC.

In theory, such systems can serve as a community forum because of the wide availability of channels and the simplicity of the equipment needed. Unfortunately, experience with public access cannot help but arouse pessimism about the prospects for the future. *Bona fide* efforts of over-the-air television to provide outlets for community expression have often had negative results. The process of obtaining community access is complex and requires a direct positive input by those concerned with the use of media as an outlet for community expression.

One notable example of a successful community operation which provides a model for educational applications is Videographe of Montreal. Videographe was begun in 1971 under the National Film Board's **Challenge for Change** Program. The original goal of the group was to enable ordinary people to have access to production and viewing facilities so that they could reflect their community concerns through the medium of television. The centre originally provided 1/2 inch video production and viewing facilities to accomplish this goal. The centre now has a library of over 2,000 productions and it acts as a distribution network to some 100 locations in Europe and North America where these tapes are sent.

Videographe has now embarked on a long term social experiment which has the goal of eventually earning a license to broadcast and to use CATV facilities to reach the citizens of St. Jerome, Québec. Presently, they are working in close cooperation with the St. Jerome CTV (community television) group. Using a low-power UHF transmitter, they are able to operate a full-fledged community channel. The cable system in St. Jerome is one of the country's most advanced and can provide up to 30 channels with two-way transmission. Thus, the system can provide a wide variety and can accommodate both audience response and remote transmission.

One of the background reasons for the cable station's decision to provide a bi-directional system was their opportunity to see the Videographe experiment called Selecto-TV. Under this programming format, subscribers to a cable system are sent a list of available videotapes and can call the local channel and make specific requests of what they would like to see. Requests are tallied and a moderator tells the subscriber when the program will be shown. This involves the positive element of audience choice for programming during any given spot and can be highly interactive so that, for example, programming can be selected up to the time it is broadcast.

The idea behind Videographe is essentially educational: to create community access to cultural resources. By involving the community in the process of production and by playing tapes produced by the community, the hope is not only to develop a different perspective from the commercial media, but to solidify the alliances and common feelings which people share.

However, it is still an open question as to what demands can be made by educational authorities upon the cable television industry in terms of using a local channel for even simple educational purposes. The reality is that cable operators have only a vaguely-defined responsibility to reflect their communities through some sort of community programming. There are no rules about how extensive the responsibility is, to whom specifically it is owed, what percentage of subscriber revenue must be devoted to it, how much programming must be produced, or what, exactly, the programming is supposed to accomplish. What type of service can be negotiated with the cable licensee depends upon the size of the community, the size of the system, the nature of the demands, and most particularly the feeling of the licensee about the extent to which he is already fulfilling the CRTC's expectations.

With regard to the role of the "educational channel", it appears to be premature to request all operators in Nova Scotia to provide such a channel. There appears to be an ideal opportunity to experiment with cable in one or two communities, with the support of the operator, the CRTC and the community. Such an experiment may lead to a uniform cable education policy for the province.

It is therefore suggested that educators across the province, especially in the communities already served by a cable television system, should be introduced to the potential of cable television systems. This could be achieved through seminars and field trips to the communities where cooperation already

exists between the cable operator and the local educational authorities. In order to familiarize educators further with the potential of cable television systems, and to determine educational needs for such systems through direct contact with the technology, it is recommended that:

a pilot project should be set up connecting schools and resource services in at least one area to investigate the role which cable television can play in the educational process.

This pilot project would provide educators with an experience in working with cable operators and an understanding of the advantages and problems associated with cable television. This would be of great value if the pilot project were later to lead to an extension of educational use of cable television throughout the province. Studies and discussions should therefore be carried out in order to determine the conditions under which cable television channels should be made available for educational programs.

.8 Radio Broadcasting

Radio broadcasting has been used for educational purposes for many years. In comparison to television, the cost of radio is extremely low, yet the potential is quite high; indeed, for some teaching applications, radio is as effective as television.

Radio has a number of advantages: radio receivers are inexpensive; large segments of the population can be reached if time on commercial radio stations is used (the terms under which time can be made available must of course be studied in detail, and the appropriate negotiations undertaken); and the production of programs is relatively inexpensive. However, the information flow is one-way: interaction is limited to a small portion of the audience using the telephone and is also slow when the mail is used.

In spite of the advantages of radio, especially in comparison with video transmission systems, minimal educational use is made of this medium in Nova Scotia. As noted above for cable television, it is therefore suggested that educators across the province should become aware of the potential of educational radio. Other techniques, such as audio transmission via CATV channels and FM channel multiplexing[7] should be studied in detail. This could be achieved through seminars and field trips to communities where educational radio is extensively used.

In order to familiarize educators further with the potential of radio, and to determine educational needs for such systems, the following is recommended.

The role of radio facilities in the educational process should be studied in detail. This study should be undertaken during the course of the proposed Phase II; the study could well lead to a pilot project also being undertaken during Phase II to provide educators with experience by directly working with the technology.

While educational radio may be what is required in Nova Scotia, it is also possible that the requirement is really only for audio programs which should be made available using audio tape recorder/players and physical means of distribution. Audio tapes do have the advantages of low distribution costs and inexpensive tape dubbing; moreover, with tape recorders under student control, instruction can be individually timed and paced.

.9 Voice and Picture

The communications services available from the common carriers have been examined in Chapter 2. The first service, and undoubtedly the most valuable, is the familiar telephone network. The uses of the telephone are so well known that they will not be expanded upon here, except in terms of two particular applications. The telephone might be considered as a prototype technology which could serve as a model to other systems. It is universally accessible, easy-to-use and is not imposing. As such it seems an ideal communications and educational device.

Possibly the most obvious use of telephony is tele-teaching whereby lectures and panel discussions are carried over the telephone network. Speaker systems in remote classrooms can be used by students for having a conference on the network system, making comments, or asking questions which are then heard in all other remote classrooms. Lectures can be enhanced by using supplementary material which is previously distributed to all remote locations. This material could include slides, filmstrips, films and videotaped programs which are started, shown, and stopped simultaneously at all locations, to complement the audio material carried by the telephone network.

In addition to providing direct teacher-student and student-student interaction over distances, such networks can be used for staff and administrative meetings, thus eliminating many miles of travel.

The operating costs for telephony can be fairly high, however, especially with very distant connections.

Another noteworthy application of tele-teaching involves using the telephone network to transfer pictures, charts, text, and so forth over distances; this is achieved by using the electrowriter, facsimile, or slow-scan television. The electro-writer is a device by which material written at the origination point is transmitted over a telephone line and reproduced, as it is written, by projection on a screen in the receiving room. Using a second telephone line for voice communication, this service provides a reasonable approximation to "chalk and talk" over a distance.

While the electrowriter is "real time", showing writing as the originator writes, facsimile and slow-scan television transmit documents at a slower rate page by page. These services make it possible for images or written materials prepared in advance to be reproduced in virtually the original form at the transmission reception point. The resolution of the transmitted picture can be made as detailed as required by increasing the transmission time; three to five minutes is usually required for an 8 1/2 by 11 inch page or picture. These relatively long transmission times inhibit interactive communication and drive up costs. Costs are also relatively high because of the expensive equipment required for facsimile or for slow-scan conversion at both the transmitting and receiving ends. Facsimile tends to be used for the transfer of graphic material, while slow-scan television is used more for still or slowly moving pictures.

These three services can be used wherever telephones are available, with costs increasing with distance as long distance charges increase. However, interference on the telephone lines can cause problems involving malfunctions of the electrowriter equipment; this can cause poor quality reproduction of material at the receiving end for all three services.

In order to familiarize educators further with the potential of the telephone and telephone-based services, and to determine educational needs for such services, it is proposed that:

- ***the role of telephone and telephone-based services in the educational process should be studied in detail in conjunction with the proposed review of the provincial government's telecommunications services***[8].

The study could well lead to a pilot project during Phase II to provide educators with first-hand contact with the equipment.

.10 Broadcasting Authorities

A subsidiary issue related to the question of production is the possibility of establishing a central broadcasting authority which could handle school broadcasting. "Educational communications activities" is a general term which encompasses the assembling, production, distribution and transmission of all educational broadcasts.

At present this work is being carried on by bodies which run the gamut from multi-million dollar corporations to *ad hoc* relationships between a subdivision of a Department of Education and the CBC. Since educational broadcasting is a matter of split jurisdiction, the ETPNS group attempted to analyze the relationship between the federal government and the various provinces on this question.

The Canadian Radio-Television Commission (CRTC) issues all broadcasting licenses in Canada. In 1972 the Federal Government issued a directive to the CRTC[9]. This Order-in-Council states that broadcasting licenses cannot be held by any municipal or public body empowered to perform a function of government in a province or any corporation empowered to perform a function or duty on behalf of the government.

The order also creates a special body called an "independent corporation." This "independent corporation" can hold a broadcast license for certain purposes. Basically, this means that such a corporation must not be directly controlled by any municipal or provincial government and the material which is broadcast under this license must be of an educational variety. At present two corporations in English Canada hold such licenses: the Ontario Educational Communications Authority (OECA) and the Alberta Educational Communications Corporation (AECC).

Various alternative designs for an educational communications system have been considered as part of the ETPNS study. Prior to the emergence of ETPNS, the Total Educational Program Development System for Nova Scotia (TEPDS) conducted a study on the design of an educational broadcasting system in Nova Scotia[10].

The TEPDS study concludes that such a broadcasting system is necessary and that an educational communications system would integrate all aspects of educational activity in Nova Scotia. The study outlines a number of design objectives to be incorporated in the development of such a system: (i) that the system be designed with the view to balancing immediate implementation against compatibility with future technologies and non-educational

communications; (ii) that the degree of interaction desirable between student and educational medium, as well as between schools, be examined carefully; (iii) that the system be built with economy, reliability, maintainability and simplicity in mind; finally, (iv) that well-defined criteria of evaluation be built into such a system which would be tested at periodic intervals.

The three provinces considered by the ETPNS regarding educational communications are travelling three divergent paths. From the beginning, Ontario has been dedicated to setting up an expensive set of broadcasting transmitters which will allow it to reach most of its people via off-air educational channels. OECA is, in fact, a product of Ontario's efforts in this direction.

For a variety of reasons, the Province of Québec is not included in this report. The government of Québec has indicated that it will follow a path similar to that of OECA, but on a much broader basis. In fact, at the moment, Québec is doing more in this area than any other province. Because it uses a **structure** similar to that of Ontario, it was not felt necessary to review the Québec situation.

Alberta, which entered the field later, attempted to learn from Ontario's actions. With this in mind it attempted to ensure that the "independent corporation" necessary to obtain an educational broadcasting license under Order-in-Council 1972-1569[11] would not be so independent of the Department of Education as to allow divergence of policy to develop between the two. As such, it set up a provincial authority which exercises a great deal of control over the corporation. At the same time Alberta must work out a relationship between the authority and the corporation which satisfies the CRTC.

Saskatchewan has learned from both provinces, feeling that Alberta's dual authority approach is necessary to ensure that the real needs of the Department of Education are met by the corporation. At the same time Saskatchewan has moved away from any immediate commitment to off-air broadcasting, questioning whether or not the expense of such an operation is equal to the actual educational value gained from it.

At the moment, there does not appear to be an immediate need to establish such an authority in Nova Scotia. However, as various elements of ETPNS are implemented and as various new plans are developed, such a need will probably become more imperative. For this reason, it is recommended that all future plans by the department take such a possibility into consideration. The following is therefore proposed.

The Department of Education should not make any decision to implement the concept of an Educational Communications Authority until both the need and the desirability have been documented.

When required, the desirability of establishing an Educational Communications Authority should be analyzed and its possible structure detailed in conjunction with the appropriate representatives of the provincial and federal governments and industry.

.11 Networks and Educational Discounts

The Department of Education, the school boards, the schools and resource bodies in general depend heavily on communications facilities which can be provided by either MT&T or CN-CP. The prices for services are established in accordance with tariffs (*i.e.* are regulated), or with traditional utility pricing philosophies. Such an approach does not usually recognize the concept of discounting.

Whether discounts for educational purposes for services rendered by telecommunications companies in Nova Scotia are possible depends upon an analysis of the regulated and non-regulated portions of telecommunications business, and upon the meaning and effect of the statutory discrimination clause. These two questions must be analyzed by comparing the legislation governing the federal regulatory board, the Canadian Transport Commission (CTC) and the Board of Commissioners of Public Utilities for the Province of Nova Scotia.

An analysis of the **Railway Act**[12] which prescribes the CTC's powers and duties, and the **Nova Scotia Public Utilities Act**[13] reveals that it is *conceivable* that a discount for educational communications could be obtained.

However, the likelihood of a discount depends upon the following conditions:

- that the appropriate regulatory board consider the provision of educational communications as a matter substantially different from the provision of general communications services and therefore worthy of special rate considerations; or
- that, in the case of MT&T, the services fall outside of the sphere of direct regulation or that the appropriate Board approves the concept of education users as a separate class; and
- that the company be willing to provide services on a discounted basis; and

• that the provision of such services not violate the "unjust and undue" clause in the Act [14].

If an obvious need for such services can be illustrated, then it may be necessary to seek amendments to the appropriate Acts in order to allow the companies to provide a discount for educational users. Before attempting to develop the terms of such an amendment, it appears necessary to analyze the total educational communications costs in order to develop an appreciation of the potential savings to the users and the potential cost to the suppliers. The proposed study on provincial government telecommunications services is likely to provide the basis for such an analysis.

.12 Concerns Over Copyright

The present Copyright Act goes back to 1921 and is now so outdated that it requires substantial revisions. It does not, for example, specifically recognize the existence of such comparatively modern innovations as video tape, audio tape, photocopying, *etc.* There is one reference to "radio communication" but none to television broadcasting. The Department of Consumer and Corporate Affairs is presently working on a study paper, due to be released towards the end of 1975. The paper is expected to take into consideration the rapid advances being made in the field of communications in order to clarify the position regarding copyright in such media. This will most likely lead to the introduction of amendments to the existing legislation.

It is a generally accepted fact that educators have been having difficulty with the Copyright Act on a broad scale for many years. However, there have been few Canadian cases on the subject, and the exact lines of infringement are therefore still unclear. Publishers, for example, have expressed an increasing concern over the wholesale photoreproduction of educational materials, but seem reluctant to take the matter to court, possibly for fear of losing the good-will of the educational market on which they are so dependent. It is also quite possible that they are merely awaiting the publication of the proposed study paper to see if their rights are protected more clearly in the proposed legislation.

The Department of Consumer and Corporate Affairs (Bureau of Intellectual Property) has been receiving briefs and conducting inquiries among the most interested parties for several years. The suggestion has been made that provincial educational authorities should present a submission, possibly through the office of the Council of Ministers of Education. Since even minor revisions in the Act could result in either major expenditures or savings for educational authorities, such a course seems prudent indeed.

The following means should be considered as a way of dealing with this situation.

The educational authorities of the province should cooperate fully with the Council of Ministers of Education in planning and preparing a presentation to the Bureau of Intellectual Property, Department of Consumer and Corporate Affairs, putting forth the province's position and legitimate concern in the area.

Further, the educational authorities should prepare a paper pointing out the specific concerns of the province and the possible effects of any changes in existing copyright provisions.

In addition to basic copyright, there is a field involving what the Economic Council of Canada's **Report on Intellectual and Industrial Property** [15] calls "neighbouring rights". According to the Report, "four separate groups of this sort are currently considered key participants in these distinct but related rights: broadcasters, sound recorders, publishers, and performers[16]."

Given the antiquity of the Copyright Act and the number of neighbouring rights that have since sprung up, there are remarkably few people in the country who have a clear, detailed knowledge of the workings of this Act. The wisest opinion seems to be that when there is any doubt as to who owns the copyright, it is best to bypass the Act completely, because of its uncertainties, and have the situation governed by specific contract. The following is therefore proposed:

the educational authorities of the province should request that the Department of the Attorney General make available one lawyer to research the position of the educational authorities with respect to present contracts and to draft future agreements with teachers, film distributors, outside performers, musicians collectives, and so forth.

It should be noted at this point that the Governor-in-Council for the Province of Nova Scotia has issued an Order-in-Council 73-415[17] designating the Executive Director of the Communications and Information Centre as the officer responsible for ensuring that Her Majesty's copyright privileges are fully protected. Also proposed is that an Order-in-Council or separate report be drafted so that:

the educational authorities should be fully advised of the true impact of Order-in-Council 73-415, and appropriate procedures should be established to facilitate the exercise of the duties and responsibilities of the Executive Director of the Communications and Information Centre.

There is a need to bring some order and rationalization into the existing systems within the province as well as a need to prepare for the future. This need can best be met by assigning the duty to prepare the appropriate policy statements and copyright contracts to one person who can work with a representative of the Attorney General's Office. Numerous specific issues dealing with teachers' and students' rights to copyright of school-produced materials and discounting arrangements with record manufacturers need to be worked out. Present methods, which require piecemeal decisions on these matters, are less than satisfactory.

There will be a cost associated with establishing the appropriate procedures to deal with these questions. However, a failure to correct the existing practises will tend to inhibit the development of resource services in the future.

.13 Electronic Networks—Computers and Information Retrieval

It is no longer possible to view computers in isolation from the communications environment which surrounds them. When one speaks of computers, one is intrinsically speaking of networks. This situation owes its existence to the development of time-sharing computers with remote access capability so that, for example, a student may work at a computer terminal which, though located in the classroom, may in fact be connected to a computer many miles away.

Computers offer a great potential. Of all the technologies being considered here, the ramifications of computer technology are probably the most difficult to predict. In the present context, the potential of computers revolves around the question of computer assisted learning (CAL) and information resource management. On the other hand, the foreboding aspect of computers is perhaps characterized by their potential to de-personalize the learning process or to destroy our privacy.

As noted in Chapter 2, computers have already begun to be used in education in Nova Scotia. Several different methods of obtaining computer services are in use, ranging from posting cards to a remote service bureau to using a stand-alone mini-computer (a small computer located in the place it is actually used) for basic services. The most sophisticated systems rely on remote terminals having access to a central computer at some distant location.

Other technologies, such as tying central computers together with smaller mini-computers, thereby distributing the computing load, have not been tried in Nova Scotia. In this kind of application, any given terminal may use a mini-computer for small applications, but may be switched to a larger computer when more power is needed. Since mini-computers are less expensive than big computers, and since communication costs over distances are expensive, this kind of mixed system involves balancing the costs of computer power and communications. Such systems, often called distributed systems, have advantages in terms of system reliability and substitutability of system parts.

This kind of distributed system is only one of many possibilities for use of computers in education in the province. There are several different applications, independent of the technology, which should be considered first, however.

The Teacher Information File to be considered later, is not dealt with here, except to note that a series of files should also be maintained of Nova Scotian computer facilities and suppliers, maintenance facilities, teachers with computing experience, *etc.* The files of computer facilities would not necessarily be computer-based.

Of more direct applicability to administrators in schools and school boards is the possibility of extending the current scheduling and report card services, both of which are well accepted already. Therefore, in-depth follow-up studies should be undertaken to expand upon these services. The benefits of computer scheduling, for example, tend to be greatest in schools offering several elective courses in many rooms, and having a large student body. The first task should involve determining which schools have scheduling problems, and why scheduling software is not used in some larger schools. Of course, some schools have large numbers of students, but because these include elementary and junior high classes, there may not be as great a need for class scheduling as in schools having only high school students.

An annual cost of an estimated $250,000 could be involved in obtaining scheduling and report card

services for the 71 high schools in Nova Scotia having at least 350 students each. This cost might be reduced if some form of "package deal" could be negotiated for a region or for the province as a whole, or if the services were to be offered using the Provincial Government computer.

Further studies are required to analyze in detail the full administrative needs of larger schools, of school boards, and of the Department of Education; these studies should indicate the further services, such as bus scheduling, which should be introduced. The possibility of using mini-computers, operated by school boards and possibly connected to a centralized departmental facility for management control, should also be examined. The use of Telex/TWX for administrative applications also deserves consideration. It is therefore proposed that:

an in-depth study should be undertaken of current and potential administrative applications of computers and data communications facilities in education in the province.

While certain administrative applications can readily be shown to be cost-effective, and therefore should be introduced immediately, it is very difficult to estimate instructional costs or savings. Nevertheless, it is here that the computer is expected to have its greatest impact on the educational system. Instructional computer applications in youth education are becoming well accepted, but it must be emphasized that, with exceptions, many of the current applications are not very sophisticated.

The computer is obviously useful as an instructional aid in mathematics and related classes, where it can be used as a rather complex form of **calculator**. Of course, the role of electronic calculators in the classroom also deserves further examination in this context: it may be that a widespread distribution of calculators would adequately meet classroom needs.

As calculations become more complex, as in statistical manipulations and mathematical modelling, the role of the computer really changes to **analysis**. Here numerous computer programs can be used, and the possibilities of exchanging programs within the province and of purchasing existing programs should be examined in the light of comments from teachers. Extensive use of computers can be envisaged in many subject areas, notably mathematics, chemistry and biology. Direct terminal access to a computer is suggested here, with one terminal per 50 students to permit weekly access to the computer.

At the next level of sophistication, the computer becomes an active partner in the instructional process, rather than just being an instructional aid. **Computer assisted learning** (CAL) is now relatively common in areas which are mathematics-related, as well as in many other areas such as second language instruction and special education. It should be noted, however, that many computer assisted learning applications are still experimental; it is therefore not surprising that the active computer-teacher partnership implied here is not always as acceptable to teachers as the calculator and analysis roles mentioned previously, where the computer is very definitely only an instructional aid.

Recognizing that computers are becoming more pervasive in society, it can be argued that students should be made aware of what computers are, what they can do, the extent of their power, and their limitations. This would assist both students and teachers in preparing for the many adjustments likely to be made necessary by future developments in computer technology. This suggests that the Department of Education might consider introducing students to computers through a "computer literacy" course which would cover the impacts and future possibilities of computers. Such a course would not necessarily require programming skills, and only a minimal number of programs might be used.

It is suggested that the Department of Education should consider whether such a computer literacy course should be introduced, and if so, whether it should be offered to all students. It would also be wise to determine the content and duration of the course, and the type of computer equipment which would be most appropriate. A policy decision by the department on whether the computer ought to be a curriculum item seems to be the first step involved here.

In the light of these instructional applications, it is proposed that:

an in-depth study should be undertaken of current and potential instructional applications of computers and data communications facilities.

In view of the potential of computers in these areas of education and considering the observed growth of computers in Nova Scotian schools, it would be advisable to reassert the principle of channelling computer development in the province through the Management Consulting Services arm of the government[15]. This will avoid costly duplication of effort, and will broaden the pool of expertise necessary to make wise decisions concerning hardware and software development.

.13.1 Information Retrieval

In recent years, as computer techniques have become more sophisticated, the role of the computer as an information management tool has increased considerably. Information management differs from traditional computer applications in that the cataloguing, storage and retrieval of great amounts of information are stressed, rather than the performance of a large number of computations. When used for information retrieval, computers can offer access to and control over a wide range of information sources so that, in the case of education for example, both administrators and planners as well as teachers and students can benefit.

A major problem associated with the development of such widely-applicable systems is developing the necessary degree of coordination between potential users in terms of the kind and extent of information they require. As the data bases containing the information expand in application and utility, both the amount of information stored and the methods of access to this information increase. Moreover, the information requirements of people change over time as new sources of information become available, and as information becomes outdated and useless.

The development of broadly-based information systems will demand a high level of coordination and control if the information is to become and to remain useful to the normal user. Only by pooling computer expertise and by coordinating information requirements can the appropriate software be developed, or located, to serve a variety of users on a compatible and efficient basis. The emphasis on coordination and planning is vital since even the simplest systems can be costly to develop and maintain in order to effectively serve even the most basic information requirements.

The planning of an information management system should rely on a carefully-developed and well-coordinated long range plan. This plan should be drafted on the basis of the following considerations:

1) a comprehensive survey of user needs;

2) a detailed specification of the types of files to be maintained and the services required;

3) identification of the potential growth and future requirements of these services;

4) examination of various alternative configurations as to their costs and likely need for implementation;

5) a study on the most efficient and effective mechanism for exchange of educational information;

6) formulation of a long-term policy and plan based on existing provincial resources.

These steps would ensure the evolution of a provincial education information management system which would be relevant to the present and potential needs of users and others concerned with information. A basic principle in the development of policy is that the implementation of the information system should be based on existing expertise and resources. Ideally, the system should be compatible with other information networks at both the provincial and federal levels. This coordination will require the continuing participation of the province's division of Management Consulting Services.

The methods of information retrieval will be influenced by the demand for decentralized regional centres and expanding educational services in rural areas. One possible approach to meeting such a demand is to establish a communication link to a central computer processing facility using dedicated lines and making the communication link available to all areas of activity in the educational sphere on a shared basis. The sharing of expensive communication hardware would cut costs, but each user could still have access to a dedicated file which might even be stored on separate computers. With proper design, privacy can be maintained, while resources can be shared.

This is a logical expansion of a computer system and well within the capabilities of existing technology. It is more than a simple information-retrieval network: it is an organizational structure with broad ramifications. Such a network could have the beneficial effect of strengthening the ties between different levels and programs of the Department of Education or between the schools and the communities they serve. This would enable these different people to share the same sources of information and make it possible for them to communicate with one another through the same informational base.

In Nova Scotia, there are at least two areas where information is being used in a fashion which lends itself to an information retrieval system: the libraries and the Department of Education, especially the TRCH. These agencies are at different stages in development of information retrieval systems. They should coordinate their development and work towards a merged system.

Librarians in Nova Scotia have begun planning for the day when computer files will be linked across Canada in common library file systems, with regional and local data banks all being compatible. In this context, close cooperation is required with the National Library, with the Canadian Institute

of Scientific and Technical Information, and with other institutions regarding the compatibility of the form of information in data banks, methods of documentation, and approaches to information retrieval.

The possibility of working with other centres in the Atlantic region should also be examined. This could be related to the study which examined computer use in universities in the Atlantic region[19]. Information retrieval terminals would probably be located first in regional resource service sites, giving access to centrally-located files. As the demand for a computerized information storage and retrieval system grows, terminals could be added as local resource services in such places as schools or public libraries, when required.

The Teaching Resources Clearing House is also very much concerned with collecting information and maintaining it in a readily accessible form. The viability of a computerized file system at the TRCH should be studied in detail, including the possibility of offering teachers a ready means of information access. By beginning a master file in Halifax, and planning for extension of the file retrieval system, the TRCH could become a major information storage and retrieval service in Nova Scotia. An extensive study is obviously needed of the types of files to be maintained, of teacher service requirements, of various alternative configurations, and of the costs of implementation.

For both the library system and the TRCH, it is proposed that:

an in-depth study should be undertaken of current and potential information storage and retrieval needs and possible means of meeting these needs in accordance with the terms of a long-range plan.

The scope of possible administrative, instructional, and information storage and retrieval applications of computers in education, the need for in-depth studies in all of these application areas, and the high costs associated with the implementation of computer-based systems—all indicate the requirement for an appropriate centre within the Department of Education. This centre would be charged with examining computer applications and with formulating policy recommendations. An interrelated administrative, instructional, and information retrieval system will require careful planning, coordination and continual assessment to ensure a controlled growth in the province.

In view of the need for overall planning, the department should give consideration to the creation of a position of "Computer Applications Coordinator". The first task of this person would be to cooperate with the province's computer division, Management Consulting Services, in order to make a more thorough study and analysis of the current situation. Policy implications of specific recommendations could then be examined. This person would also coordinate, monitor and evaluate pilot projects to obtain information on the demand for, and use of, various computer-based applications.

The introduction of new computer-based applications, and the extension of existing applications, can be successful only if the teachers and administrators involved are familiar with the computer and are aware of how to use it effectively in the educational environment. This implies that pre-service and in-service exposure to computers is a prerequisite for the uses mentioned above.

Post-secondary institutions would be involved in this pre-service training, and might also be involved in providing in-service training because of their experience in the computer field. It is therefore important that further possible working relationships between post-secondary institutions and the high schools be examined in some detail.

The possibility of cooperation in the information storage and retrieval field between high schools, regional resource services and post-secondary institutions should therefore be examined. It might be appropriate to establish an integrated network to serve all of these institutions. Post-secondary institutions, with their extensive experience of computer applications, could play an important role with respect to the overall introduction and extension of computer applications in Youth Education.

.13.2 Resource-Management Systems

As information storage and retrieval expands in scope, its function shifts to an overall resource-management and information-handling tool, providing a broad range of sources of information to a wide variety of people. This type of expansion could have significant implications in terms of enriching the range of information available in the learning environment.

In education, users of such systems may be teachers, students, school administrators, agencies such as the TRCH, and the Department of Education. A thorough approach to the educational information needs of these users will call for specifications and definition of the data and reports required at all levels of the educational system. The information generated must meet the criteria of accuracy, timeliness, compatibility and comprehensiveness.

For administrative users, there will be a need for the establishment of procedures such as methods for periodically collecting, processing, and integrating data so that a controlled flow results. Other users may want data only occasionally; nevertheless, basic information will undoubtedly require continual updating.

The outstanding advantage of using computers for information handling is the speed with which they operate and their ability to cross-reference various files quickly and accurately. With appropriate file linkages, students and teachers may use information retrieval systems to perform research, to search for specific items of information or to learn about provincial resources which may aid their work.

With integrated data bases and appropriate cross-linkage searching via computers, management statistics can easily be produced. Speed and accuracy in educational decision-making can be enhanced, making the task of educators and administrators in reporting to the public much easier. Information can also be valuable in future planning for resource budgeting and allocation. With the ever increasing pressures on school systems to provide more services, maximize effectiveness, and minimize costs, the possibility of integrating some of these files into a common information system for effective educational decision-making should not be overlooked.

Much information can be stored in a common management information system, and an integrated data base can be used to support all the information processing activities of the school system. These would include the regular data processing applications of payroll, accounting, scheduling, *etc.* Reports can be distributed on a "need-to-know" basis so that middle management gets the detailed information it needs while senior officials are freed of administrative details (yet receive a meaningful broad outline report).

Development towards an integrated management information retrieval system should proceed in a phasing-in fashion with measured steps and periodic evaluation. These systems are not only extremely difficult and costly to establish but can lead to even greater costs if they do not live up to expectations.

.13.3 First Steps

Nova Scotia Libraries—Because of national and international activities, libraries are in an ideal position to apply computerized information retrieval concepts quite quickly. Use can be made of existing manual approaches, and the results of other computerized developments can easily be incorporated. Recent declines in the school population, coupled with an increasing requirement for continuous education throughout life in order to keep pace with changing times, has caused a greater emphasis to be placed on out-of-school education. Nova Scotia libraries are currently serving over 90% of the population of the province and are therefore prime candidates in serving the information and educational needs of any continuing educational efforts.

The kind of broad accessibility to information and approachability which libraries in the province offer could expand the information-utilization of a computerized system immeasurably. Since libraries already have well-developed information-sharing arrangements, coupled with appropriate information-handling procedures, it would seem highly likely that a computerized system modelled along present lines would yield immediate benefits, with great expansion potential. In terms of the number of people who would use this information, such an application may very well offer the lowest cost per information search.

The TRCH—Because of its role in cataloguing and retrieving information and material, the TRCH will be involved in responding to many requests from various communities throughout Nova Scotia. In order to respond quickly to such requests, the TRCH will require effective information retrieval and communications systems.

Implementation of a province-wide educational data system for the TRCH will require the use of the provincial regional library system to provide access from all educational levels. The establishment of such educational information links for the TRCH would enable its role to be satisfied; once established, the network could also act as a common user communication system for departmental information dissemination and collection.

Initially, however, it is expected that manual processing of data and materials by the information system provided by the TRCH will be adequate. In time, volume and cost-benefit analysis will determine the necessity of changes towards mechanization or computerization.

The Department of Education—The Department of Education maintains a Teacher Information System, and could be involved in recording student information files, curriculum files, and other management functions in the future. It is suggested that the department examine its educational file system with the view to making portions of the file available to the TRCH (*e.g.* teacher qualification files for locating resource personnel to aid other

teachers in the province) and with a view to using TRCH facilities for collecting information and offering departmental services such as classroom scheduling to boards. Long range plans should be formulated for making such files compatible with the TRCH and the library system, in order to effect a more comprehensive management information system in the future.

It is critically important that the means of organizing information retrieval be founded on the proposition that information, to be effective, must be used. This means, for example, that it must be accessible; it also means that it has to be relevant. Thus the information should be stored so it can be retrieved in either as detailed, or as abbreviated, a form as is necessary to the person who is using it. The commands associated with the system must be as simple, or as complex, as necessary, depending upon who is using the system. In this fashion, a flexible system may be created which can be accessible to both experts and laymen alike. In the final analysis, this will ensure the most cost-beneficial use of the system with the maximum assurance of continued wise development built in.

It is proposed that an integrated information system should provide:

- coordinated and integrated information services;
- local and regional growth of the system (field offices or, eventually, regional data-processing centres);
- services based on user needs, ensuring maximum accessibility and distribution of information;
- a capability for handling large amounts of information;
- compatibility with other information networks;
- flexibility to adapt dynamically to progressive changes in the system and to user requirements;

Agreement is required between all levels of government, institutions, organizations, and agencies to remove administrative barriers restricting cooperation among users of this information service system.

.14 Amalgamated Networks—CORES

The discussion in the chapter so far has led to a consideration of many of the key aspects requiring specific attention in Nova Scotia if an economical and integrated system of education technology is to be constructed with maximum beneficial impact. Thus hardware supply and maintenance, software distribution, broadcasting, and computer networks have been considered as they relate to the learning environment. This discussion has been couched within the framework of teacher education and evaluation, reflecting the commitment to accessibility and verification of the usefulness of potential implementations.

As difficult as it might be, such a far-flung discussion as this would be better grounded if a summarizing focus could be found upon which these key aspects of educational technology could be based. This is true not only in terms of organizing the present discussion, but also in terms of organizing the development of educational technology in the future.

Throughout the discussion, mention has been made of the concept of the regional resource service. This concept, expanded somewhat to include the notion of an organized system of regional services, forms the basis of the kind of summarizing, or amalgamated, network being sought here. Coordinated resource services, or CORES as they are called, comprise a tri-level system of local, regional, and provincial units which has been designed to meet some of the needs in relation to educational resource management and distribution which have been mentioned throughout this report.

A commitment to accessibility of resources in the learning environment implies that local resource services should provide the focal point of educational technology for both teachers and students. Since it is somewhat uneconomic to locate all resource services locally throughout the province, a back-up system of regional and provincial resource services is required. This is both the raison d'être and the organizational basis for CORES.

.14.1 Operation of CORES—Local Level

Local resource services may be made available in schools, libraries, community centres, or from one or many of the range of local centres in any given area. Wherever local resources are provided they must be readily accessible to both students and teachers. The tie between school and community can also be strengthened by making these resources readily available to the community-at-large for such activities as continuing education.

Strengthening community involvement in this fashion can lead to the better utilization of resources (after hours, on holidays, *etc.*) and to expanding the resources available to the schools in the community, such as cable companies and fac'ories. The idea of local resource services is to provide the materials and atmosphere in order to maximize the

benefits of a small-scale community setting while simultaneously maximizing the benefits of more distant, consolidated centres by placing less-used or more expensive resources in those locations.

The facilities located in each local centre would therefore be very basic, consisting of production and display equipment. This equipment, and supporting software, could be selected from the basic list outlined in earlier sections of this chapter and would include: photographs, models, slides, filmstrips, tape recordings, records, transparencies and a range of equipment necessary to produce these materials such as tape recorders, cameras, drawing supplies, *etc*. These resources should be provided in a coordinated fashion, not only as they relate to consolidated CORES, but internally, at the local level, so that, for example, the distinction between school and library resources would be minimal.

In order to ensure optimal facilities utilization, one or many resource specialists should be made available at one or many sites of the local CORES network. Thus, a librarian could serve as a resource specialist, as could a teacher with appropriate audio-visual and educational technology training. One of the jobs of this person would be to store audio-visual materials in a central location, and to catalogue and update all materials within the school. This catalogue should be sent, at suitable intervals, to the regional CORES which then could therefore compile and up-date a catalogue of overall regional software holdings. Copies of this regional catalogue should be distributed to the schools or to sites of the local CORES.

Teachers and students wanting resource materials could then borrow equipment and materials directly from the local CORES; software could also be ordered, through the resource person, from the regional CORES. If the regional CORES did not have the software requested, it could in turn order it from the provincial CORES. It is apparent that telephone communications are invaluable for this ordering; one should therefore be available to each local CORES. Later, this network could be expanded and accommodate an information-retrieval system, as suggested earlier.

The local CORES would also act as a production centre for simple but rapid production of materials by students and teachers. Teachers should be able to produce within their own school most of the audio-visual materials they require, except those requiring more sophisticated preparation. Teachers can mount their own pictures, make transparencies, gather kits, and so on. Also, they can make their own still pictures and movies. Teachers would, of course, have access to the local resource person in any production activity.

Other jobs of the resource person would be to acquaint all teachers with the available audio-visual production and display equipment (and this implies providing some basic in-service training); to answer relatively simple technical questions; to obtain expert advice from the regional or provincial CORES; and to undertake first line maintenance and repair of equipment.

It is apparent that the school or local CORES generally supports classroom and community activities in the provision of audio-visual services which are responsive to the needs of students and teachers. The organization of local CORES in terms of personnel, budget, control and authority depends very much upon the local school system, and so cannot be dealt with at this stage in the ETPNS studies. The physical facilities to be provided will depend very much upon the scope and size of the local resource services to be provided; the augmentation of facilities required must obviously be dealt with on a case-by-case basis.

.14.2 Regional CORES

The first level of back up in the provision of basic supportive services for educational technology is at the regional level, through regional CORES. Regional CORES are needed to store and distribute expensive and less frequently used equipment and materials (such as 16mm films and videotapes), so that they can be shared among several local areas. Such equipment and materials can be pooled for distribution to these areas or can remain fixed at a regional centre for common access.

A comprehensive cataloguing of all equipment and software available in the region is required to prevent duplication of infrequently used items and to ensure that effective use is made of all available resources. This catalogue (based upon reports received from schools and local CORES) would be updated and distributed to schools and resource services within the region, to other regional CORES, and to the provincial CORES. This comprehensive information service, in conjunction with a parallel ordering service, would do much to increase the utilization of software and equipment throughout the province.

The regional CORES would also be highly involved in the provision of other services which are too expensive to provide locally, such as more complex and time-consuming production (especially for materials related to curriculum courses). The usefulness and utilization of production facilities by

teachers and students depend very much on the training and support that is available, in addition to the necessary time alloted for such work. At this time, major expenditures on regional studios and related production equipment should follow the coordination, identification, and efficient utilization of existing regional production resources. Appropriate training should also precede additional expenditures on production facilities, in order to ensure effective utilization.

Other functions to be included in regional CORES are second-line maintenance and repair of equipment, provision of both a demonstration centre for equipment and a viewing room for new productions, provision of a training centre for training of teachers and students in the use of equipment, provision of individual aid and advice as requested, and so forth.

For regional CORES to be accessible to students and teachers, and to the community as a whole, it is suggested that they should be open in the evenings and on Saturdays and holidays. Moreover, each site of the regional CORES should have a van so that it can provide pick-up and delivery service for equipment and software materials, to school and local resource sites. The van could also be used for servicing (such as first-line maintenance and repair), and for demonstration of resource material and equipment. In addition to the regional vans, there should also be a van for the provincial CORES, as it will be transporting larger volume shipments between a small number of locations. The central van could go to each of the regional CORES every week to keep them supplied, and could also return all equipment which needs repair or has been repaired. The alternative of using commercial delivery should also be considered for use by provincial CORES.

A new administrative structure need not be necessary in order to manage the CORES operation. One possible administrative arrangement would involve a broadening of present job functions to include a facility for cooperation and shared responsibility. Such a facility could be provided through a committee with a chairman and power to ensure that sharing takes place.

Regional CORES would manage both traditional library services and the added audio-visual services. The Chief Librarian would be responsible for cataloguing and other functions associated with printed and non-printed material, including the acquisition, ordering and distribution of these materials, and the provision of information related to them. Since users would in many cases be located well away from the regional CORES, these functions take on added importance.

An audio-visual media specialist, on the other hand, would be responsible for professional services related to the use, planning and production of audio-visual aids in education. This specialist would assist teachers in the production of audio-visual materials, give advice on equipment, act as an audio-visual consultant to schools, conduct or arrange for training courses for teachers, and provide demonstrations of effective use of technology in education. Another role would be to coordinate the use of resources in the region by encouraging exceptional teachers to prepare local productions for use by others, by coordinating the sharing of expensive equipment or facilities, and by preparing plans for the acquisition of new materials in the region.

Technical service responsibilities of the audio-visual media specialist would relate to repair and maintenance of equipment and resource materials, duplication, editing, film processing and other technical operations. This person would, in effect, become a regional CORES field worker by visiting schools and giving them advice and assistance. Initially, it is proposed that A.V. media specialists should be funded from, and have direct links with, the Audio-Visual Services Activity within the department's Cultural Services Program.

.14.3 Provincial CORES

The highest level of back-up in the provision of basic supportive services for educational technology is at the provincial level. Expensive services, which can only be located centrally for the whole province, would be provided from Halifax. Included here would be a complete production centre for film and videotape programs, based upon the current ETV production unit. The following would be provided as well: sophisticated production facilities and experienced personnel for province-wide curriculum materials (such as museum kits); comprehensive duplication and software maintenance and repair services (for such things as audio tapes, videotapes, films, and filmstrips) and third line maintenance and repair services for severe equipment breakages.

The provincial CORES would also provide a central cataloguing service for the regional CORES (with feedback from them as noted in the previous sub-section), a central pool or library of expensive software such as 16mm films and videotapes for distribution, and a weekly van service to and from the regional CORES (as noted above). Another function of the provincial CORES would be coordinated purchasing of equipment to secure the advantages of

bulk buying power and standardization. This coordinated purchasing could be extended later to include software as materials.

The provincial CORES would also have a demonstration and training centre, and an evaluation section to assess the cost-effectiveness of educational technology equipment and systems. In addition, a central information service would provide advice to teachers, students and resource personnel in lower-level resource services on equipment usage, production techniques, suitability of software, and, generally, on ways of employing educational technology effectively in the learning environment.

An information service is extremely important since it is central to the concept of back-up support to the learning point. Locating A.V. services field workers in regional CORES will aid in providing information on educational technology throughout the province. But since large numbers of field workers will not be hired immediately (phased introduction of regional CORES is discussed in the following sub-section), there will be a need for direct lines of communication to the Department of Education.

The existence of a well-advertised single address where teachers could write for information, or even a free telephone information centre through which requests could be channelled, would have two results: teachers would feel that their needs were being attended to; and the department would have more awareness of needs and so could redirect its programs accordingly. The implementation of this service must be preceded by an assessment so that the appropriate expertise and resources to process the requests are available. Otherwise the service may prove more of a hindrance than an aid to improving relations between teachers and administrators.

The provincial CORES would obviously grow from the current Cultural Services and Audio-Visual Instruction branches of the Department of Education. It is premature at this stage to attempt to indicate just how this growth would take place and what the final organizational structure would be like; indeed, any such attempt would go well beyond the terms of reference of the ETPNS report. Nevertheless, it is expected that the provincial CORES would provide all or most of the functions and services listed above.

.14.4 Number and Location of Regional CORES

Having identified the three levels—local, regional and provincial—for the provision of basic supportive services related to educational technology, the question arises as to the number of regional CORES and their location. An answer to this question, giving optimal or near-optimal locations, would require extensive further analysis based upon data on school types and locations, terrain, road conditions and other aspects of accessibility, and on the specific functions to be performed. This analysis would then use a decision rule, such as: "Locate the regional CORES so that no more than X teachers must be served by each, with no teacher having to travel for more than Y minutes to reach a regional CORES site." Such an analysis is very complex, especially since constraints should be included, such as: "Regional CORES must be based in regional libraries, high school libraries, museums, or teacher training centres."

A simpler approach is to begin with the Graham Commission recommendations: in proposing eleven new county regions, the Graham Commission recommended the regional libraries as an ideal basis for regional resource services. An extensive survey of these libraries was therefore undertaken[20] to investigate their suitability and the feasibility of implementing this recommendation. This survey, which provides a comprehensive statement of the current circumstances of the provincial library system, should be used in planning the utilization of any of the regional libraries as bases for regional CORES. A major conclusion of the report is that libraries be used for provision of a wide range of information and audio-visual services, **but that film materials not be stocked there** as suggested by the Graham Commission.

Using the eleven regional libraries in this fashion would provide a logical and much needed extension of Audio-Visual Services from Halifax into the province, where the needs lie. At the same time, this arrangement would take advantage of the existing regional libraries' competence, availability, and experience. Only two of the regional libraries, Truro and Yarmouth, now have the necessary space to provide complete A.V. services; all regional libraries require extension to provide suitable A.V. services. Additional staff are also required to manage the A.V. resource materials and treat requests for information, ordering and distribution of such material. They might be termed Educational Liaison Officers since their role as librarians in the regional library system would be to service the book and audio-visual material resource needs of the schools. These officers would require full- or part-time clerks.

In addition, the A.V. media specialist required for

each regional CORES would need a full- or part-time technical assistant, and an allowance for transportation and communications, to fill the role of regional field worker. The cost of staff additions to each regional library, to provide regional CORES functions, could well be in the range of $50,000 per year.

As a matter of equity, all teachers should have reasonable access to regional CORES; similarly, the specialists at the service should be able to cover the region's schools and local CORES adequately. Thus geographical distance and transportation routes are important for both the regional service's staff and teachers. But balanced against this, is the fact that if cost per teacher were to be taken as the criterion for locating regional CORES, some rural areas with low population densities might not be near a regional CORES.

On the other hand, the Regional Centres proposed by the Graham Commission are based on historical, political, and cultural considerations which may not necessarily be relevant to the needs of educators. These Regional Centres are listed in the first column of Table 4-8. The second and third columns list the present 11 headquarters and certain sub-headquarters of the provincial library system; these are placed in correspondence with the nearest proposed regional CORES. With the exception of Antigonish, every proposed regional CORES has either a headquarters or a sub-headquarters of the provincial regional library system very close to it. An excellent correspondence exists between the Graham Commission recommendations and the provincial library system. This may be the best reason for choosing these locations for regional CORES.

A few changes are recommended, however, to give a better geographical coverage of the province. The proposed system of regional CORES and sub-CORES is shown in columns 5 and 6 of Table 4-8. This has 10 regional CORES, excluding Antigonish and Dartmouth which are listed as sub-CORES (with the option of being regional CORES). A number of sub-CORES have been added: Digby, Shelburne, Sheet Harbour, Canso, St. Peter's, Chéticamp and Inverness, for a total of 10 regional resource services and 9 sub-CORES. The extra sub-CORES are added to provide a local basis for the sharing of equipment and resource materials, particularly in less populated areas; most schools would now be within 35 miles of a regional CORES or sub-CORES.

The sub-CORES would be regional CORES in some respects but not in others. They would have adequate, but not sophisticated, production facilities. An advantage of considering a larger number of regional CORES is that in the transition period, while inventories of equipment and resource materials are being augmented, extra regional resources could be shared until schools reach their requisite levels.

The proposed system of regional CORES would not be implemented complete with all resource services immediately. Instead, a phased approach is expected. The actual speed of phasing-in the regional CORES will depend upon budgets and the success of the early steps taken in the phasing.

In order to determine exactly which facilities and resources are required for these regional CORES, it is recommended that:

model regional CORES, with the support personnel and facilities required, should be established as pilot projects in Truro (for Colchester-East Hants) and one other location.

This proposal should be undertaken during the course of the proposed Phase II. If direct experience with these pilot project regional CORES shows the concept to be workable and useful, then it could be expanded by stages to four and eventually nineteen regional CORES and sub-CORES, as suggested above.

4.14.5 Distribution of Materials Among Schools

The key to distribution lies in having an adequate supply of materials easily accessible to those wishing to use them. The requirement for additional software resources—including film loops, filmstrips, audio tapes, records, slides and transparencies—has already been noted. Since these are relatively small, inexpensive, and used on a day-to-day basis, they should be located in schools or in local resource services for small schools which do not have the room or size to justify having complete resource holdings in the school. Librarians or library-clerks within the schools might be used to organize a filing system for such items, and to keep them available to all teachers. The local resource services mentioned here might well be at Regional High Schools, providing resource services for their "feeder" schools.

In principle, with good communications (telephone and Telex/TWX), teachers can obtain information, order material, and receive advice on audio-visual matters without going near the regional resource service. However, nothing can substitute

Table 4-8. Regional CORES

Graham Commission Regional Centres	Regional Provincial Libraries		Regional Cores	
	Headquarters	Sub-Headquarters	Regional Cores	Regional Sub-Cores
Yarmouth	Yarmouth		Yarmouth	Shelburne, Digby
Bridgewater		Bridgewater	Bridgewater	
Kentville		Coldbrook (near Kentville)	Coldbrook	
Halifax-Dartmouth	Halifax-Dartmouth		Halifax	Dartmouth,* Sheet Harbour
Truro	Truro		Truro	
Amherst	Amherst		Amherst	
New Glasgow	New Glasgow		New Glasgow	Antigonish
Antigonish				
Port Hawkesbury	Mulgrave		Mulgrave	Canso
Baddeck		Baddeck	Baddeck	St. Peter's
Sydney	Sydney		Sydney	Chetic amp, Inverness
	Halifax County (Hal.)		—	—
	South Shore (Hal.)			
	Annapolis Royal			
	11	3	10	9
11	14		19	

*These could be Regional CORES

for previewing resource materials, personal discussions with resource specialists, and ready access to special production facilities.

The proposed Graham Commission Regional Centres, and the current regional libraries in the province, have been examined as to their suitability in meeting teachers' needs. Modifications to most of the existing locations are deemed necessary; increases in library and audio-visual staff are also required if they are to provide regional resource services for the schools. The audio-visual half of the operation is viewed as a direct extension of the present Audio-Visual Services of the Department of Education. This could be achieved within the present departmental framework.

If the new provincial-municipal structure proposed by the Graham Commission is introduced, the above plan can be implemented with no great difficulty. It is therefore not necessary to await a decision on the commission's recommendations in order to proceed with the introduction of regional resource services.

Various forms of transportation can be used for the distribution of materials between the provincial resource service and regional resource services, among regional resource services, and between regional resource services and local (or school) resource services. These forms of transportation include teachers' private vehicles, bookmobiles, regional van services, mail, and commercial delivery.

The appropriate combination which provides effective service with minimum cost can be determined only by experimentation in each region. Teachers may be willing to drive 10 or 20 miles to

preview and study the resource collection at the regional resource service. Many regions currently have bookmobiles which could be used to carry small audio-visual materials; this possibility should be given serious consideration. Mail and commercial delivery are probably too expensive for minor media. If none of these is satisfactory, an additional van or car may be less expensive than purchasing the additional materials and storing them in the schools. A van could also be used for other services such as repair; this should be determined in the proposed pilot studies.

Two further comments are appropriate. Efficient distribution of materials will be possible only with good communications as well as good transportation. It will therefore be necessary to improve communications within the region and inter-regionally by installing two-way radio service in bookmobiles and audio-visual vans, Telex/TWX in regional resource services, and telephones in all resource service locations. Moreover, teachers must have time to visit local or regional resource services.

14.6 Teachers, CORES and Broader Educational Access

In keeping with the ETPNS philosophy, one of the major thrusts of the CORES design is to attempt to meet a long-standing grievance of teachers, as reflected in the field seminars, that centralized resource services impair resource utilization on the local school level. The problem is a difficult one to resolve, since centralized and decentralized systems both have their relative strengths and weaknesses. In terms of accessibility, for example, a decentralized system may seem ideal, yet in the case of access to 16mm film it would not be feasible due to the high cost of buying multiple copies of films and supplying supportive film library services.

Should decentralization seem desirable, then the lack of a facility or organization between the provincial level, based in Halifax, and the school resource centre has to be overcome. Although pilot projects will be necessary to test the idea, it is recommended that existing facilities be coordinated to meet the needs of a region through the CORES organization. Thus, services may be strengthened, and new services created, without replacing existing viable means of accomplishing the goals of resource access and utilization.

Services considered within this concept include the regional libraries, vocational schools, regional high schools, and government departments. The form and organization required will doubtless vary from area to area. However, there are several features which will probably be common to all. First, CORES should be operated by, or at least advised by, teachers or users. Secondly, the Regional Library should provide the central information retrieval system for the area.

Through CORES, teachers should have access to information about resources—such as print, nonprint, or human resources—available at both local and provincial points. Teachers should also have direct access to regional holdings of software available to schools in common. They should have access to production facilities which allow them to go beyond the minimum facilities provided in their schools as well as access to training opportunities or opportunities to work with other teachers to develop learning resources.

Work during Phase I has indicated that some services cannot be decentralized under existing circumstances, and appear to be best left as provincial services. One of these is the 16mm film library. Proposals have been forwarded to initiate several pilot projects which may facilitate distribution. One of these would be the coordinated booking and delivery service. Thus, for example, two films ordered by teachers in the region would be sent in one bulk container from the central library, and then delivered by truck within the region. A second system will involve the use of a cable station. A bank of films will be placed in the station, and teachers may book a film to be shown during a free period in the cable station's schedule. They would then pick this up on their normal television receiver or record it for later use.

It will still be necessary to maintain some production facilities at the provincial level because of the excessive cost and inefficiency of totally decentralizing them. For example, teachers have asked for more 16mm films dealing with aspects of Nova Scotia. It would not be possible to equip each regional service with 16mm equipment. Thus, although a request for a film (including research and content) may emanate from a specific region, the production should be done by or arranged through a provincial service.

The production capability, which has been made available through the agreement established between the CBC and the Department of Education in 1962, can now be viewed as even more important because of the means of extending the use of these productions with video playback equipment and the CATV stations. Thus, if the minimum list of equipment, which includes the videocassette player, is available in a school, and if education channels are

available through cable stations, teachers have three means of access to the ETV productions.

An important consideration quite apart from these exciting technical possibilities is that the content and quality of the programs meet the needs of students and teachers. This can only be assured if opportunities are developed for teachers to have an adequate input at all stages of the program development process. This can be facilitated best through the regional service and can be done in a similar way as described for the production of local resources. For example, a committee of teachers in Digby County could work with the CBC through their regional CORES to develop a broadcast quality film or videotape on the fisheries of the Bay of Fundy. Once the production was complete it could then be available to any teacher in the province through the various distribution systems anticipated—film library, videocassette, a cable system, or network broadcast.

Large scale productions can perhaps be located more easily at the provincial level. This is not the case with smaller format production such as audio tapes, 35mm slides, filmstrips, and photographs. Although the production facilities for each of these will be available to teachers either within the school or the region, there are still topics, which because of their complexity or provincial applicability, should be done at the provincial level. The ultimate concern here is that such production does not limit regional activity but rather complements it, and that topics chosen reflect the needs of teachers as expressed through the regional CORES.

It has been previously noted that, at the school and regional level, emphasis should be placed on coordinating existing services and resources in order to allow maximum use. This same emphasis also applies to the provincial level where problems have been caused by a fragmentation of services and resources.

A committee of Department of Education staff, responsible for the provision of resources, should work together during Phase II to develop a coordinated service which will better meet the needs of teachers. It is not possible to prejudge the form that such a service will take. However, as in the regional CORES, it appears that the central source of information for the province will be the Provincial Library System which would then provide a network, together with the Regional Libraries, in order to make information flow more easily for the student and teacher. It is also likely that the Audio Visual Service activity will expand to take on the production role of other activities and in this way simplify the paths teachers must use to gain access to resources.

The use of computers in instruction, administration, and information retrieval has already been discussed. The access which teachers and students will have to computing facilities will depend on the studies and pilot projects which have been recommended for Phase II.

It is difficult to be as precise concerning other levels of education as it is with teachers and Youth Education. Because a great deal of work remains to be done in the areas of Adult, Pre-School, and Special Education, it is difficult to propose a more specific measure than one which would ensure that resources developed for Youth Education would also be available to other forms of education. Perhaps the two areas which will be of most immediate concern to those involved in Adult Education will be those services offered by the Provincial Library System through an expanded information retrieval system, and secondly, the opportunity to use the educational channel of the cable T.V. system as well as the resource bank located at the cable station.

The Provincial Library System is, in every sense of the word, a community service, and nothing being advocated for Youth Education should be thought of as a lessening of the general community nature of the libraries. Rather, services which are developed for Youth Education will be an expansion of the community service as the facility will be available to all library users. It is also important that an organization established to develop or operate the regional CORES include people involved in Adult Education, so that their needs can be met and their services used.

A cable network offers a unique opportunity for Adult Education because it allows programs to be made available to people in their homes or it allows instructors in various locations to share resources. It can also allow instructors to complement class sessions with films or specially prepared programs which can be seen by the students independently in their homes or at their places of employment. Production facilities at the regional CORES and with the provincial A.V. Service should also be accessible to Adult Education staff.

Similar statements may be made for pre-school education. Indeed, the intent here is to broaden the extent of resource accessibility beyond the school into a wider view of what is involved in the learning experience, and just what resources should be available in order to complement this experience.

Since programs for children under school age fail

into several categories, it is rather difficult to describe the situation clearly. Terms such as "day care", "pre-school", "nursery school", "play school", "head start" are all being used to describe programs being operated in the province. A rough distinction can be drawn between day care programs which have as their prime purpose the supervision of children of working parents and general nursery school programs which are aimed primarily at providing an educational opportunity for children. Both of these approaches are, for the most part, offered to children between the ages of three and five. However, some day care programs report children as young as six months.

Although the Department of Education's mandate does not make provision for pre-school assistance, all potential training institutions should be encouraged to assist pre-school teachers or day-care supervisors in better equipping themselves for their role. It is suggested that during Phase II further steps be taken to investigate other means by which in-service training at this level can be facilitated by the use of technology such as cable T.V., audio and videotapes.

One of the serious drawbacks to an adequate use of audio visual aids is the lack of funds available for the purchase of hardware and software. This emphasizes the need for access by pre-school staff to facilities available at other levels and for training in the preparation of resources for their own use.

In terms of provincial resources and facilities, where feasible, pre-school groups should have access to the loan services available to schools. This would include the 16mm films, and the duplication of audio and videotapes. All Educational Television guide books relevant to pre-school programs should also be made available.

The services of the Teachers' Library should be made freely available to pre-school teachers, and steps should be taken to encourage teachers to become aware of this resource. Many of the Regional Libraries also offer special programs such as "Story Hours" which are available to pre-schools. Such activities should continue to be encouraged and supported by the Department of Education. The design of the information retrieval system to be associated with the Provincial Library should take into account the needs of the pre-school level, and an input from teachers should be sought to ensure that the needs are known.

At the regional level, School Boards should be encouraged to make the facilities of CORES available to pre-school teachers. This is particularly important in the areas of production, training, and in the use of production facilities. As indicated above, the skills and opportunities given teachers to produce their own pre-school materials should prove to be an invaluable aid in combating the previous lack of funds available for the purchase of resources.

Even though the emphasis here has been predominently with Youth Education, the hope is that eventually this emphasis will give way to a broader view of education. The tri-level system of CORES, and a prudent choice of CORES location and management procedures, coupled with other recommendations here, is meant to expedite this process. The expectation is that this concern will become more dominant in Phase II of the study.

.14.7 The Significance of CORES

The CORES concept seems a reasonable summary foundation upon which the future of educational technology in Nova Scotia can rest. This is based upon several assumptions which can be outlined and evaluated when the CORES concept is phased in. It is assumed, for example, that the CORES network will create the kind of integrated approach towards resource management and resource sharing which will lead to both an understanding of educational technology and to accessibility to the resources necessary to enhance learning in the province.

Although the concentration in the discussion above has been upon software and hardware distribution, the broader impact of CORES should not be forgotten. The CORES concept represents a comprehensive approach to educational technology development. Stripped of its equipment and software-handling characteristics, it would still be a valuable concept in terms of its organizational role and the resulting strengthened commitment to existing resource utilization on a broad basis among all levels of education and the community.

Indeed, in the long run, the most significant development emerging from CORES may be the tri-level form of organizing access and decision-making that it affords. At the same time, it is an organization which can be expanded to accommodate future developments in broadcasting or computer network technology such as cable systems and information retrieval networks.

Cable—both historically and technologically—is essentially a locally-based network. Yet cable also depends on a variety of programming which relies on centrally-provided and professionally-produced programs. A CORES network is ideally constructed to efficiently utilize these divergent attributes of cable owing to its tri-level system of organization.

Information retrieval has a similar diversity of attributes. As noted earlier, information retrieval systems depend on a resource-switching network to optimally balance the cost of communications to a powerful distant computer against the availability of less expensive, and less powerful, local computers. In many cases, information management and utilization is better accomplished at the local level, whereas the real power of the information system often comes from its centralizing and summarizing ability and ready access to a wealth of information from a variety of sources. Once again, the organizational structure of such a system is perfectly matched by the proposed structure of the CORES network.

Perhaps the most important feature of the CORES concept is the kind of flexibility inherent in distributing the administrative load of the system throughout the network. This strengthens local involvement, access, and control, which is essential in making resources available in the learning environment, and in fact, in extending this environment beyond the confines of the school walls. Thus CORES represents a timely approach to the necessity to enrich the learning environment by taking advantage of outside resources while not detracting from the role of school as culture-creator; indeed, it strengthens this role.

Footnotes to Chapter 4

1. ETPNS. Working Paper No. 6425, *op. cit.*
2. Wilkenson, *op. cit.*
3. M. Binks, M. Beckingham, M. McLeay and E. Stuchan, "Resource Centre Standards", Ontario Teachers' Federation, Toronto, 1971.
4. Department of Audio-Visual Instruction, NEA, "Standards for School Media Programs", American Library Association, Chicago, 1969.
5. This estimate does not include the value of centralized holdings.
6. A similar argument could also be used for Super 8 film: if there were no 16mm film or equipment, it might be preferable to introduce Super 8 film.
7. FM channel multiplexing enables broadcasters to supply music service separate from their normal programming, making the simultaneous transmission of more than one program possible. This technique is known as Subsidiary Carrier Authorization. Only those listeners equipped with special FM radios can receive the transmission.
8. To be conducted by the Nova Scotia Office of Communications Policy.
9. Order-in-Council P.M. 1972-1569, July 13, 1972; SOR/72-261, **Canada Gazette**, Part II, July 26, 1972, p. 1047.
10. TEPDS Working Paper No. 5, "An Integrated Educational Communication System".
11. Order-in-Council 1972-1569, *op. cit.*
12. The Railway Act, R.S.C. 1970, ch. R-2.
13. The Nova Scotia Public Utilities Act, RSNS, 1967, C258 (as amended).
14. *Ibid.*, s. 104(1).
15. Economic Council of Canada, "Report on Intellectual and Industrial Property." Ottawa: Information Canada, 1971.
16. *Ibid.*
17. Order-in-Council, 73-415, May 15, 1973.
18. Government of Nova Scotia, **Management Manual**, Policy Statement: Provincial Data Centre, 10-p.25, Feb. 2, 1970.
19. Program for the Sharing of Computer Resources in the Atlantic Universities, *op. cit.*
20. ETPNS. "Impact on Regional libraries and Schools", Working Paper No. 6421.

5 CONCLUSIONS FROM THE INITIAL PHASE

The Educational Technology Program for Nova Scotia marks the first occasion that a provincial government has joined with the federal government to analyze the future use of educational technology within a province. The terms of reference for this investigation were broad, and the period of study for the Initial Phase was relatively short; consequently, the stress was placed on establishing an overview, without placing an unnecessary emphasis on specific areas within the overall theme. A decision was therefore taken to outline the major aspects of the subject, concentrating in such areas as teachers' attitudes and resource documentation, in order to form a framework from which more detailed analyses could be drafted later.

Throughout this study, an attempt was made to consider the issue of educational technology in its entirety. For example, both suppliers and users of technology were considered in such questions as software access. In this fashion, data on equipment were correlated with the areas of purchasing, repair, signal reception, training, production, storage, and so forth. Furthermore, the program attempted to investigate the learning environment as a whole, and not simply the classroom; the study has therefore included an examination of pre-school and community activities, for example.

Naturally, in the limited time available, the greatest emphasis has been placed on primary and secondary education; however, this emphasis has been tempered by the information gained on activities occurring in other levels of education. The recommendation to establish a departmental committee on provincial integration and co-ordination is the direct result of the investigators' experiences in dealing with groups involved at various levels of the system. The experience also led to the organization of the remaining recommendations to be found here. Because of their significance to the overall project, it is important to understand the logic behind the drafting of these recommendations.

The first recommendation is a general **Policy** statement which has many broad implications. These have been outlined. The second recommendation supports a **Philosophy** which can be applied to the policy complete with corresponding implications. Both these recommendations draw upon the results of studies as outlined in previous chapters (listed in Appendix B).

In drafting these recommendations, the choice was between listing dozens of specific recommendations--each of which would have to be analyzed,

accepted or rejected—or to develop two main conceptual recommendations. These two recommendations include a description of the various broad implications, the details of which can be developed over time. These major recommendations, or proposals, are supported by a number of *a priori* sub-recommendations in the chapters leading up to this conclusion.

The third major recommendation concerns **Implementation** and is phrased in terms of a number of specific sub-recommendations. Obviously, this is not the total list of ideas developed or conclusions reached by various committee members and participants. In several cases, ideas are already being extended and plans are being implemented as a direct result of Initial Phase activities: specific educational television and radio programs are being continued or rejected on the basis of the survey conducted; inter-departmental activities and discussions are being initiated in an attempt to coordinate the resources of government; training programs are being developed; data for future activities are being collected; and discussions are being held with such governmental agencies as the Nova Scotia Communications and Information Centre.

The first three recommendations, and associated implications, stand on their own. They are not contingent upon acceptance of the fourth major recommendation, which would initiate Phase II of the ETPNS program. The concept behind Phase II is to utilize the expertise and rapport developed during the Initial Phase in implementing the recommendations and to continue expanding activities which were started. The fourth recommendation should be considered as a more explicit statement of Phase II activities which were previously sketched briefly in the original terms of reference for the overall program signed by the Federal and Provincial Ministers on April 23, 1974.

The acceptance of Phase II will not lead to the development of a permanent Educational Technology Program which might parallel the efforts of present programs such as TRCH. No permanent position will be established, and no permanent structures created within the Educational Technology Program. Indeed, there is an explicit recognition that the ETPNS is limited to the phases outlined in the terms of reference of the original Joint Agreement. The goal of the ETPNS is to create an on-going philosophy regarding the treatment of educational technology as an integral aspect of all Department of Education activities. Thus, CORES for example, will be fully incorporated into the department from the outset, and no gaps will be left as the ETPNS is phased out. In keeping with the approach which has been developed throughout the report, the intent of the program is to use, whenever possible, existing or modified departmental structures, programs, activities and funds for all ongoing operational aspects.

One final point should be emphasized with regard to the Initial Phase: the value of involving participants from a variety of departments, organizations and governments has been considerable in achieving program goals. The federal government, the provincial government, the cable television operators, the common carriers, the broadcasters, the Nova Scotia Federation of Home and School Associations, teachers and various community and other educational organizations have all assisted in this project, the majority on a voluntary basis. The resulting rapport is concrete evidence of the interest which exists in this field and of the desire of all to ensure that Nova Scotians attain the maximum benefit from technology. Even though the size of the Steering Committee makes it unwieldy and inhibits discussions, it is nevertheless true that much can be accomplished through subcommittees which would not be possible for a smaller body with less participation.

.1 Recommendation I—Policy

It is recommended that the Minister of Education assert the principle of the provision, by the Department of Education, of basic supportive services related to educational technology in order to meet present and anticipated needs throughout the province.

The key words here are "basic supportive services". This recommendation seems necessary to provide a uniform decision-making base in handling training, software and materials, production, equipment, and facilities in the province. The Department of Education should encourage school boards to provide these services in keeping with their responsibilities as defined in the Education Act, and Regulations under the Education Act. The provision of these basic supportive services should be under the control of recognized structures (department programs and activities, or school boards). There should also be appropriate delivery systems and communication networks **throughout the province** (including universities, schools, libraries, museums, communities, and the public-at-large) to provide these services in a coordinated fashion.

The Initial Phase of the program has reached the

point where preliminary lists of required basic resources can be detailed, potential user groups have been identified and involved, and at least one distribution and communication mechanism can be described. The purpose of the following sub-sections is to expand upon the possibilities raised by combining these factors into a single policy on basic supportive services.

.1.1 Learning About Educational Technology

In attempting to provide for the successful incorporation of educational technology within the schools of Nova Scotia, it is necessary to consider the steps to reach such a goal. The most important priority in this progression is the most obvious: that of training in educational technology. Teachers must have the opportunity to become knowledgeable about the principles and practices in this field so that they can use available resources and so that they can control the pace and degree of use of future advances. They should also have specialists at their disposal to help them plan and prepare teaching units.

By accepting Recommendation I, the Department of Education will be making a commitment to the concept of educational technology as an integral element in the learning environment. An agreement to accept such a recommendation cannot be effective without a firm stand on teacher education.

This commitment is extremely important, given the thrust of this recommendation within this report. The emphasis is upon establishing a thorough understanding among teachers, who are considered as prime movers in association with students in the learning situation. Thus, teacher education must go beyond simple mechanical mastery of various media to a broadly-grounded understanding of how these media can be incorporated into the classroom environment and what their effects are likely to be. In this fashion the teacher can take an active role in structuring the technology, rather than simply being expected to react to pre-existing technologies in a set fashion.

As outlined in Chapter 3, teacher education can be divided into two main categories which will incorporate both the professional and para-professional aspects of the field. These two categories can, in turn, be broken down in order to include the various programs which should be considered:

Professional

1. Pre-service—University or college
2. In-service—professional development
   (i) Summer school
   (ii) Evening credit courses
   (iii) Workshops and conferences
   (iv) Training sessions
3. Specialization—Specialist programs
   (i) Summer school block program
   (ii) Special Bachelor of Education program
   (iii) Graduate programs in educational technology

Technical

1. Media Technologist Programs

Future in-service developments will require agreement on their value by both the Department of Education and the various school boards. For this reason, the department should encourage the development of policy statements from all boards, indicating their support for such programs. The department's Teacher Education Program and the Atlantic Institute of Education should develop learning packages for teachers and, where possible, introduce them throughout the province by means of various incentive programs.

There is also the problem of locating media technologists in the educational structure. Persons with this training have to be recognized for the valuable assistance they could supply to teachers. Since the media technologist would have some teacher education, the department would have to look upon that person as an integral part of the educational process, not as one who has merely received some technical training.

Therefore, the Department of Education should establish basic criteria for recognizing at least four categories within the Teacher File: (1) program development; (2) funding; (3) certification (where appropriate); and (4) all other purposes. This last category would contain information on four areas of teacher competence.

The first area would consist of teachers with basic background in educational technology either from pre-service or in-service activities. The second area would consist of media technologists as developed at Holland College and elsewhere. The third area would consist of professional educational technologists; and the fourth area would consist of the

already recognized school library personnel. Personnel in these last three areas could act as resource specialists for students, teachers, schools, boards and training programs.

.1.2 Software and Materials

The major conclusion regarding software is that there is not enough to complement existing equipment in the province. This underutilization of equipment has contributed to the failure of educational technology to live up to its original expectations. The need to develop flexible funding formulae to allow greater purchases of software must be considered in the light of developing systems for producing, distributing and sharing resources.

.1.3 Production

The consideration of production requirements must again begin at the learning point. Sub-recommendations have been made concerning equipment, materials, and training. These recommendations are important in overcoming the problem of the relative lack of software at the school level. In terms of a media system, it is necessary that the appropriate display equipment be available. There is little point in considering the use of 35mm cameras, for example, if slide projectors, screens and room darkening devices are not available.

The aspect of the regional sharing of production equipment and facilities being recommended would be an expansion of a system successfully operated by Regional Libraries since 1949 under provisions of the Library Act. It is appropriate to test the feasibility of this expanded system before departmental policies and funding arrangements are decided. Funds should be made available within regional resource services for pilot projects to provide production facilities and equipment, as set out in following sections.

.1.4 Equipment

The Department of Education should actively attempt to equalize resources throughout the province and establish a minimum list of equipment which can be available to all schools. This does not mean that equipment should be provided without consultation, but rather that the department should be prepared to respond to certain requests from each community in order to allow them to attain the minimum standard. The provision of this equipment, however, should be coordinated with other activities such as education, maintenance, repair and standardization.

.1.5 Facilities

Present maintenance, repair and software supply facilities which exist within the province are already too small to be of service to all schools. The Audio Visual Services section of the Department of Education has had an excellent reputation, but that reputation is suffering because the personnel are not able to cope with the ever-increasing demands placed on the service. In the future, it will therefore be necessary to take proper steps to overcome these deficiences.

Consideration must be given to an examination of the existing facilities and the need for additional facilities at the regional level. The establishment of regional CORES is viewed as essential if all schools are to have access to such services as production and repair. At present, some of the larger and newer schools have at least partial access to these kinds of services. However, without the development of regional CORES to enable the sharing of facilities, these services will either continue to be limited to the new schools or large expenditures will be required to equip smaller and older schools to the same extent.

At the local level (school or classroom), consideration must be given to the overall learning environment in terms of the use of technology, as opposed to a consideration of isolated elements such as equipment, software, and storage. During field seminars for example, teachers revealed a great frustration provoked by the lack of such essential items as blackout curtains. Even if one has access to projection equipment and the appropriate software, effective use may not be possible because the projected images are not visible during daylight. Sub-recommendations are therefore made concerning media systems, which attempt to account for all the elements required for the effective use of common media.

.1.6 Funds

The broad scope of the Initial Phase has not made it possible to develop in detail the extent of the funds required to implement all of the recommendations. However, it is essential that funds be spent carefully and wisely, and appropriate control mechanisms be retained and, where necessary, established within the existing departmental structure. Consideration of the funds required should take into account at least the following factors:

a)in-service education;

b)software and material purchasing;

c)equipment purchasing.

Funds for these activities already exist. The need, however, is to further coordinate funding activities.

In some cases the funding mechanisms will have to be modified, either to establish greater flexibility, or to provide further incentives to teachers and boards. This last point will require a more detailed analysis before further policy decisions are made.

.1.7 An Approach To The Problem of Provision

It should be noted at this point that the identification of various key aspects of technology has permitted a systematic analysis of the problem of providing services. This analysis began with the recognition and definition of a need for basic supportive services, including educational software, production, equipment and facilities. The initial provision of these services will generate a demand for a coordinated method of supplying them. An integrated system should include a method of information retrieval, policies for purchasing equipment and software, and an analysis of various distribution and communication networks.

Although recommendations for future development and implications of the Initial Phase work have already been identified, the value of coordinating and integrating efforts in these areas must be emphasized. This coordination must extend beyond traditional departmental programs and activities to include such organizations as the Nova Scotia Communications and Information Centre, the Federal Department of Communications, the Canadian Radio-Television Commission, the Nova Scotia Office of Communications Policy, the National Film Board, the Canadian Broadcasting Corporation and others. Furthermore, in recognition of fiscal and budgetary constraints, the role of regional resource services must become paramount.

.1.8 Regional Resource Services—CORES

In concluding that basic supportive services should be available throughout the province, the Initial Phase has studied the provincial and local powers, duties, and capabilities. In so doing, it is apparent that there is a vital need for regional CORES. In some cases regional resources already exist. What is lacking is a means of integrating and coordinating their functions. For this reason, rather than dealing with a centre, which connotes one building and one organization, this report has concentrated on the provision of resource services by coordinating and integrating existing functions, and thus limiting new ventures to filling gaps rather than duplicating facilities.

Thus, regional services should be identified with appropriate political units such as counties. This will enable sufficient flexibility to incorporate whatever changes might arise as a result of the possible implementation of recommendations of the Graham Commission report.

.1.9 Local CORES

At present, the organization of resource services is such that, with few exceptions, resources are located either at the learning point or at the provincial level. Ideally, all resources should be located so as to provide maximum flexibility and accessibility to the student and teacher. Even though this may not always be possible, a well planned local resource service can compensate for many of the problems of present inaccessibility.

The local CORES, several of which are presently operating effectively, is an operational model for the development of the proposed regional CORES. The operation of this service will require trained staff (full-time or part-time), an information retrieval system, production equipment and facilities, repair and maintenance services, and mechanisms for the evaluation, selection, and procurement of new resources.

The specific form and operation of the local service should vary from school to school. Therefore, there is no attempt to state precisely how such a service should be established. However, recommendations have been made concerning the basic supportive services required to enable the local resource service to function.

.2 Recommendation II—Philosophy

In the provision of services, it is recommended that the Minister of Education assert, as a principle, the integration and coordination of existing departmental programs and activities.

It is no exaggeration to say that utilization of resources can be improved immeasurably through coordinating their use and integrating sets of resources within others. This is the approach advocated by this report. Adding resources, *per se*, will not change anything as long as duplication of effort and the wasteful use of resources persists. A different kind of philosophy is required: one which stresses efficient resource utilization; one which implicitly accepts the interdependent nature of relevant educational resources; and which urges cooperation in their utilization.

This kind of approach can have significant effects. There are already many resources which could be

turned to educational purposes in Nova Scotia, if a spirit of initiative to use them and cooperation in their use could be found. Indeed, these virtues are important educational goals in their own right.

Therefore, there is no anticipation of initiating totally new programs within the Department of Education. Rather, it is recommended that there be a re-examination of the existing relevant programs and activities in light of the newly-defined supportive services. This should be done with a view to integrating, coordinating, improving and modifying, where necessary, the departmental programs and activities used to provide these services. Under these circumstances of optimal use, the extensions which are being planned will have maximum effect.

The concept of integration and coordination is more than a simple organizational matter: it has several implications in terms of the quality of the learning environment and the role of the teacher within this environment. The thrust of this philosophy is to enable a more creative approach to teaching and learning by making a wider range of resources available when they are needed, rather than having a learning situation inhibited by a more constrained access to resources. Thus, behind this recommendation is the by now familiar ETPNS philosophy of stressing the primacy of the learning point, accessibility to resources, and the unique place of the teacher within this context. Integration and coordination are not being proposed simply for the sake of streamlining administration, or economizing, but for the effect they will have on enriching the learning process over the long run.

In passing, it should be made clear that integration and coordination are not considered synonymous with centralization. Rather, they entail establishing a cooperative network, along the lines of the CORES which have been suggested, so that the administration of resources are shared throughout all levels and so that information and access are maximized at the local level.

.2.1 Teaching Resources Clearing House

The TRCH, as it is presently structured, should be viewed as a concept rather than as a specific program or facility. The idea of resource sharing is desirable and should be given priority regardless of the specific organizational entity necessary to support it. Recommendations have been made to establish a planning procedure to involve departmental staff in the coordination of their functions as they relate to the TRCH concept.

Given that the Department of Education exists to serve the needs of the learner, it is important to view all existing or anticipated services from the perspective of the learning point. ETPNS studies have identified serious problems for teachers and students resulting from the unavailability of services or because services do not have sufficient back-up resources. There are other equally serious problems resulting from a lack of awareness of a service or resulting from confusion because of a multiplicity of services.

The TRCH concept, in the broadest sense, is a way of organizing all available resources to make them as accessible as possible to meet the needs of students and teachers. This parallels the ETPNS philosophy as it has evolved throughout the Initial Phase.

Support services such as information retrieval, distribution, and training can be treated in isolation in terms of their extension from the provincial to local level. However, they can also be treated as both regional and local. It is the coordination of these services, and method of treatment at each level, which will result in the realization of the TRCH concept.

.2.2 Provincial Integration and Coordination

As a means of encouraging full representation in order to facilitate integration and coordination at the provincial level, a committee of departmental officials concerned with the provision of services should be established. This committee would prepare recommendations for the Senior Management Group of the Department of Education on the implementation of this coordination and integration. Based on the responsibilities of this committee, it is suggested that the chairman come from outside the department. This is an essential first step and should encourage and facilitate similar integration at the regional and local levels.

Suggested Minimum Composition of Committee:

Cultural Services	Director and Asst. Director of Cultural Services Supervisor of Audio Visual Services
Youth Education	Director of Youth Education Supervisor of Audio Visual Instruction
Teacher Education	Director of Teacher Education
Adult Education	Director of Adult Education
Teaching Resources Clearing House	Director of TRCH Supervisor of TRCH
Nova Scotia Teachers College	Appointment by the Principal
Educational Technology Program	Coordinator of ETPNS (Proposed position)
School System	Teachers seconded by Cultural Services With NSTU assistance

The committee should prepare recommendations concerning:

1. the coordination which should exist among programs and activities in order to provide educational technology support services as defined by the Minister;
2. the reallocating and/or redefining of positions and activities, where it is considered necessary in order to effect the coordination of educational technology support services;
3. the inclusion within the Regional Library System of the information retrieval function essential to the TRCH concept;
4. the implications of the coordination of provincial support services in terms of regional and local services.

.2.3 Regional Integration and Coordination

As stated above, the integration and coordination of support services at the provincial level is essential to encourage and facilitate a similar integration at the regional level. Pilot projects have been recommended to establish a coordinated regional service in Colchester-East Hants and in one other location. In each of these regions a committee representing the users and providers of the services should be developed. Such a committee would include representatives from schools, the regional library, universities, and other agencies providing resource services within the region.

A teacher on the Departmental Committee from each of the two regions should be seconded by the department, in consultation with the Nova Scotia Teachers Union, to the Cultural Services Program for a period of one year to provide a liaison between the provincial and regional committees. Such a liaison should assist the regional committees in deciding how to gain better access to provincial resources. Since the two teachers are also members of the Departmental Committee, this communication link will work both ways.

Funding for the regional committees should be limited to one year. Provision should be made for an extension of one year if mutually agreed to by the department and the boards in the regions concerned.

.2.4 Local Integration and Coordination

The value of the provincial and regional services can be measured only in terms of their effectiveness at the local level where students and teachers actually use the resources provided. However, in spite of any efforts which may be made at the regional and provincial levels, the need for resources may not be met without proper planning within a specific school.

Central to the development of a coordinated service at the school level is the concept that all aids to learning should be considered within the definition of "learning resources". Once this definition is accepted, it then seems appropriate that school libraries be considered as resource centres and be equipped with print and non-print materials. In some schools of the province, full-time or part-time librarians or resource specialists have already coordinated resource services in the school, and have established the means of access to resource services outside the school. The library or resource centre has thus become the focal point for a coordinated service. Such development should be encouraged by the Department of Education through modifications in the grant structure and through the consulting services.

.3 Recommendation III—Implementation

It is recommended that by March 31, 1977, the Nova Scotia Minister of Education implement minimum levels of materials, equipment and facilities, and resolve issues related to copyright and distribution.

Two important points should be kept in mind in considering the implications of this recommendation. First, there is no need to initiate a high cost crash program in order to achieve the goals set out below. Second, the cost of achieving these goals is not great compared with other educational costs. The recommendation is based on the philosophy of first using existing funds more efficiently, then using other funds which may be available but have not been used in this way before, and finally, seeking new funds only as a last resort.

.3.1 Sequence of Approach

The priorities which have been identified and adopted by this program are: 1. Teacher Education, 2. Software and Production, 3. Display Equipment and Facilities. The thrust throughout this report has been to prepare the user first, and then provide the resource materials. The assumption is that a knowledgeable user will be capable of and interested in producing specific materials to achieve self identified goals. This approach is most likely to result in the least expenditure of funds on irrelevant materials. If these three points are applied to the sections which follow, then the overriding objective of a cautious approach, tempered by experience and efficient allocation of funds, should be met.

.3.2 Teacher Education

Professional development in educational technology can be divided into three main categories—pre service, in-service, and specialist education. Teachers attending the field seminars emphasized that careful attention should be paid to each of these categories.

The Nova Scotia Teachers College should continue to develop programs in educational technology which will prepare teachers from the point of view of attitudes, knowledge and skills. Further, the Department of Education should encourage University Departments of Education to offer courses in educational technology as a part of the Bachelor of Education Program. These basic pre service programs should be coordinated with future in-service activities.

The introduction of in-service training programs should be preceded by sessions with supervisory staff to acquaint them with the rationale for the content of the programs. The Department of Education should then encourage the development of policy statements, as outlined in Recommendation I.

Because it is essential that in service programs be of a long term nature, steps must be taken in order to ensure continuing assistance for teachers. The Teacher Education Program of the provincial Department of Education should work in conjunction with the Atlantic Institute of Education in the preparation of learning materials which can be used independently. Teachers with expertise in the use of technology in education should be identified and offered incentives to assist in the in-service program.

At present, the Nova Scotia Teacher's College offers a four year summer course for practicing teachers on the effective use of resources. Teachers completing this program should be recognized by the province for the same cost-sharing arrangement as is now available for resource specialists holding a Master's degree in Library Science.

.3.3 Software

At least a minimum level of software materials should be made available in all schools and resource services in the province, according to their size and level. Wherever possible, existing funding should be used; when this is not sufficient, funding for this software should be made available by the Department of Education, in order to increase holdings throughout the province.

At the school level, there are two funding sources from which software—print and non print—can be purchased. The first of these is the newly introduced Credit Allocation System for obtaining authorized teaching/learning materials from the School Book Bureau. The requisitions from schools for the 1975-1976 school year should be reviewed to determine to what extent the system has been used to acquire non print software. The 1976-1977 authorized list should then be broadened to include more non print software materials.

The second source of funds is the Instructional Materials Grant commonly referred to as the "library grant". Boards are able to obtain cost-sharing on an amount up to $2.00 per pupil. The department should increase this amount to $3.25 for the 1976-1977 year.

Assistance to boards in the selection and ordering of learning resources is provided by the Supervisor of School Libraries. The Department of Education

should fill the position of Assistant Supervisor as soon as possible to aid in this work.

The Audio Visual Services Activity of the Cultural Services Program has the major provincial holdings of audio-visual materials for schools. Funds should be made available to bring together representatives from each of the curriculum committees to work with curriculum consultants in examining all of the holdings of the Audio Visual Library, including 16mm films, video tapes, audio tapes, and 16mm slides with a view to:

a) recommending the elimination of out-of-date material;

b) updating the catalogue descriptions of holdings;

c) preparing a report on the gaps in the holdings which should be filled;

d) determining the proper ratio of prints to titles; and

e) preparing a recommendation for the Department of Education regarding plans for selection of materials.

The Department of Education should develop a working arrangement with the Communications and Information Centre to acquire provincially produced 16mm films at the lowest possible cost.

.3.4 Production

A minimum level of production equipment as outlined in section 4.2 should be made available in all schools in the province according to their size. Whenever possible, existing funding sources should be used; wherever these are not sufficient, production equipment should be made available by the Department of Education.

It should be made a condition of providing equipment up to the minimum levels that the teachers involved receive instruction on the operation and applicability of the equipment. It is understood that further equipment should also be available from regional services, and for schools with special requirements. Teachers attending the field seminars were strongly in favour of restricting the production at the provincial level to cases where the work is too expensive or too sophisticated to be done at the local or regional levels.

Although the sharing of equipment has been common among schools within a region, it has been on an *ad hoc* or informal basis. Since this aspect of regional sharing has not been tried on a regular basis, it is appropriate to test its feasibility before departmental policies and funding arrangements are decided. However, based on such ETPNS results as **The Report on Field Seminars With Teachers**, school boards should be encouraged to provide production facilities and equipment, as outlined in section 4.2.1, so that they can be shared among the schools within their areas.

A pilot project on regional resource services is an essential first step in developing production facilities at the regional level. These facilities will supplement the production facilities available at the local level and will be particularly important in giving many smaller schools access to more sophisticated and expensive equipment than they might otherwise have available.

In order for production equipment to be utilized properly, a minimum level of production materials should be made available in all schools in the province, according to their size. The level of Foundation Grants by the province for production materials must therefore be altered to allow maximum flexibility in purchasing these materials. The specification of changes which should occur will depend on the results of the pilot projects on resource services which are being proposed for Phase II.

Production at the provincial level—including duplication services—must be examined in detail by the Departmental Committee. This assessment and the formulation of a new policy on production must be done in the light of plans for local and regional production services.

ETV and the future of audio visual education should be evaluated on the basis of pilot projects in the use of cassettes, CATV, *etc.* As a preliminary step to future development, the responsibility for ETV should be taken from Youth Education and integrated with A.V. Services under the Cultural Services program of the department.

The Department of Education should enter into negotiations with the National Film Board and commercial film distributors to establish the rates of payment required to permit the transferring of their films to video tape as well as the cost of the rights to transmit films to schools using CATV facilities. The department must also encourage school boards to use existing and any available new sources of funds to equip each school with a videotape playback device.

Although there is a requirement for the production of 16mm films to meet educational needs in the province, it would be unwise financially for the Department of Education to produce these independently. Rather, the department should develop a working arrangement with the Communications and Information Centre to provide:

a) access to all unused 16mm film footage held

by the library of the Communications and Information Centre;

b) the production of 16mm films for educational topics;

c) the acquisition by Audio Visual Services of copies of all 35mm slides held by the Communications and Information Centre, with the rights to copy these for use in schools and other learning environments.

Slide tape sets or filmstrip sets are an important resource in many schools. Although technically the production of these is possible at the regional and local levels, production of sets should also be done at the provincial level on topics which require: a) intensive research; b) special effects; and c) massive duplication.

The Audio Visual Service should maintain a file of master slides and establish a duplication service to enable schools to obtain copies of any of the masters.

The Department of Education must take steps to ensure that any production at the provincial level—16mm film, videotape, 35mm slides or filmstrips—be in response to a need expressed by teachers. The system proposed above to select new films for purchase could be used for this purpose.

.3.5 Display Equipment

A minimum level of audio-visual display equipment should be made available in all schools in the province, according to their size and level. Whenever possible, existing funding sources should be used; if these are not sufficient, this equipment should be made available by the Department of Education, in order to increase holdings in schools throughout the province to at least the minimum levels outlined in section 4.4.1. In order to assist school boards in determining priorities within their jurisdictions, Department of Education staff should visit with them to familiarize the boards with the detailed results of the equipment survey.

3.6 Facilities

Basic facilities should be made available in all schools and resource services in the Province of Nova Scotia, according to their size and function. Among the basic facilities considered here are telephone service; dehumidifiers in libraries; blackout curtains or other room-darkening devices; and Telex/TWX connections to Halifax from regional resource services. Whenever possible, existing funding sources should be used, and when these are not sufficient, these facilities should be made available by the Department of Education.

.3.7 Distribution

The following steps should be taken to improve the distribution of resources throughout the province:

- The Department of Education should pay for the delivery and return costs of all books and equipment being sent for repair.
- The Department of Education should enter into agreements with commercial delivery services in the province to enable equipment to be moved to and from the major repair service in Halifax.
- The Department of Education should install two-way radio links between bookmobiles and their regional libraries.

Two pilot projects dealing with distribution are recommended. One project is concerned with a model resource service and includes the location of a block of films in Cape Breton. The other involves the coordinated distribution of films within a region. These pilots are described in section 5.4.3.

.3.8 Distribution of Signals

A variety of projects were initiated or monitored with respect to communications facilities throughout the province. A joint Department of Communication/CRTC project has produced a detailed analysis of the reception of T.V. signals throughout Nova Scotia. This information will be used in determining an appropriate role for CBC in educational broadcasting. On the basis of findings from a preliminary survey of CATV operators, it is recommended that a pilot project be initiated as quickly as possible. Other studies have indicated that the province is making little use of radio broadcasting for educational purposes.

The desirability of developing specific programming for French-speaking Nova Scotians has raised the issue of negotiations with the CBC and this, in turn, may lead to joint negotiations with the CBC and the government of New Brunswick. A consideration of the role of telephony in the educational process (connecting schools to libraries, *etc.*) led to the conclusion that improved services and cost reductions might be possible. This must be followed up by a detailed technical study with recommendations.

.3.9 Copyright

Existing copyright practises in Nova Scotia require rationalization. This need can best be met by assigning to one person the duty to prepare the appropriate policy statements and copyright contracts.

That individual should work with a designated representative of the Attorney General's Office.

Although there will be a cost associated with such a move, a failure to correct the existing practices will tend to inhibit the development of resource services in the future. As new technologies evolve which shift the focus of visual reproduction from optical to electronic means, new possibilities will arise, and many new demands will be placed on copyrighting procedures. It is best to begin the process of rationalizing already outdated copyright procedures in anticipation of this development.

.4 Recommendation IV—Phase II

It is recommended that the Nova Scotia Minister of Education and the Nova Scotia Minister Responsible for Communications agree, subject to the development of an acceptable work plan, to undertake Phase II of the Educational Technology Program for Nova Scotia, until June 30, 1977.

In the light of the federal cabinet decision to discontinue funding the Educational Technology Branch of the Department of Communications, it is impossible to precisely define the role which the federal Department of Communications could undertake in Phase II. However, the substantial problems involved in a field such as educational technology must be taken into account as well as the benefits to be derived from working with federal departments which have the mandate to deal with national standards. Thus, one of the first steps of Phase II should be to devise, wherever possible, means of involving the federal government in a coordinated fashion.

In consultation with officials of the Province of Nova Scotia and possibly the Government of Canada, the Executive Committee will have to define in detail the work plan of projects, pilot projects, studies and other activities to be undertaken during Phase II. This work plan would indicate the objectives, methodology, activities, timing, phasing, resource allocation, and other details for each of these activities. The work plan would also describe the financial control procedures to be used, and the management responsibilities of the Review and Executive Committees.

The next step involves approval by the Review Committee of the work plan, with any modifications necessary. Once a detailed plan is approved, various interested federal departments may be approached in order to determine the degree of their interest and possible participation.

The following sub-sections outline the objectives, projects, pilot projects, studies and management structure now recommended for Phase II. It is recognized that these may differ somewhat from those which would be finalized in developing the approved work plan for Phase II.

.4.1 Objectives

The following objectives have been outlined for Phase II:

1. To provide advice on implementation of minimum levels of facilities, materials and equipment, and on the resolution of issues related to copyright and distribution according to Recommendation II.
2. To coordinate and oversee the undertaking of a number of projects concerned with preparing specific training courses and accompanying materials.
3. To conduct, evaluate and oversee the undertaking of a number of pilot projects, and make the appropriate recommendations for implementation.
4. To study in depth a number of specific areas surveyed during the Initial Phase, and make recommendations for pilot projects or for direct implementation as appropriate.
5. To study a number of new areas identified during the Initial Phase, and make recommendations for pilot projects or for direct implementation as appropriate.

.4.2 Projects

It is recommended that the following projects be undertaken to achieve the second objective:

- A guidebook for teachers should be prepared, giving information on the application, evaluation, and selection of appropriate audio-visual media to enhance the learning process.
- The Teacher Education Program should guide the preparation of suitable pre-service and in-service programs for educational technology, in conjunction with the Atlantic Institute of Education.
- A part-time media technician training program should be established, in conjunction with the Nova Scotia Institute of Technology.

.4.3 Pilot Projects

It is recommended that the following pilot projects be undertaken to achieve the third objective. These pilot projects would provide information

which could be used to guide the Department of Education in making implementation decisions.

- A pilot project on an information retrieval system for resource materials (print, non-print, *etc.*) available to Nova Scotia should be set up, in conjunction with the Regional Libraries, as a function of the Teaching Resources Clearing House.
- Two model regional CORES, with the support personnel and facilities required, should be established in conjunction with the TRCH.
- A pilot project should be set up connecting schools and various resource services in at least one area, to investigate the role which cable television can play in the educational process.
- A pilot project should be established with a limited number of video tape recorder/players located in one regional high school and its feeder schools, to investigate the role which these can play in increasing the availability of video materials at the learning point.
- A pilot project should be set up in Sydney to experiment with a coordinated delivery system for 16mm films within Cape Breton.

.4.4 In-Depth Studies

It is recommended that the following in-depth studies be undertaken to achieve the fourth objective. These studies, which would be continuations of surveys undertaken during the Initial Phase of this program, would provide information which could be used to guide the Department of Education in selecting appropriate pilot projects and in making implementation decisions. Some pilot projects derived from these in-depth studies might also be undertaken during Phase II.

- The current pilot project in educational computing should be monitored, its evaluation continued, and recommendations prepared for the Department of Education.
- An in-depth study should be undertaken in the area of equipment and material acquisition. Purchasing policies, funding mechanisms and other incentives should be examined with respect to their impact on providing cost savings, on encouraging both effective equipment use and standardization, and on promoting further use of support services.
- If it were decided that a specific pool of funds should be earmarked for purchasing educational technology equipment, or that the Department of Education should assume greater control over purchasing, then an inventory should be taken of all equipment, and an equipment management/logistics system should be established.
- The role that network facilities (including radio) can play in enhancing the educational process should be studied in detail.
- An in-depth study should be undertaken of educational communications policies, and of the desirability of the province establishing some form of education communications authority

.4.5 New Studies

It is recommended that the following new studies be undertaken to achieve the final objective. These studies, which would investigate areas identified during the Initial Phase, would also provide information to assist the Department of Education in decisions regarding appropriate pilot projects, and in making implementation decisions. Some pilot projects derived from these new studies might also be undertaken during Phase II.

- The provision of maintenance and repair services for educational technology equipment should be studied.
- A study should be undertaken in the area of information retrieval and evaluation of resource material.
- The role of educational technology in preschool education should be studied.
- The role of educational technology in special education should be studied.
- A study should be undertaken of the role of educational technology in continuing education.
- The role which universities and colleges in Nova Scotia could play in providing and sharing educational resource services should be studied.
- A study should be undertaken of the potential use of the telephone network for educational purposes. Forecasts of demand and traffic characteristics should be made for various telecommunications services; this information could be used in investigating possible approaches to reducing costs of educational communications.

.4.6 Management Structure

During the course of undertaking the Initial Phase, it has become clear that the roles of the Review and Executive Committees should be continued, while the role of the Steering Committee should be modified to make it a more effective consultative body.

If Phase II is agreed upon, the Department of Education should reconvene these committees, but with membership changes being made to reflect the

new course of Phase II. In particular, a term position of "Coordinator, Educational Technology Program" should be created within the Department of Education, and staffed immediately, to perform the coordinating functions required during this phase. It is anticipated that this position would terminate upon completion of the Educational Technology Program for Nova Scotia.

.5 Broader Concerns—Relationship to the Graham Commission

In the introduction to this report, it was stated that the major concern of this study would be an analysis of technological devices as they relate to education and how these devices could be better utilized to accomplish educational goals. The program investigators were fully aware that such an undertaking would not cover the entire field of educational technology.

Most significant of the omissions is the relative lack of treatment of the organizational structure of the schools, or the institutional and political framework of education in the province, which is, in the broadest sense, yet another technology of education. More than a lack of resources determined this omission—the report did not aim to duplicate the other recent efforts made in the province directed at just this issue, most notably the report of the Graham Commission.

Even though the various studies of the ETPNS were carried out **independently** of those of the Graham Commission, it is nevertheless possible to draw a comparison between the two reports now so that an understanding of how they relate can be gained. Hopefully, this kind of understanding will lead to a more constructive discussion of methods of dealing with education, and technology, in the province in the future.

In the discussion of the impact of technological advance upon education, the Graham Commission stressed that Nova Scotia should play an energetic part in accelerating the development of interprovincial and federal-provincial policies in order to gain the widest possible base for cooperation in communications and educational technology, especially in computer and other electronic technology. In calling for a combined federal-provincial research effort directed towards this concern, the Graham Commission substantiates the kind of approach followed by the ETPNS research.

The Graham Commission also emphasized a broadly-based composition in such a study of technology, ranging from specialists in particular areas to a variety of people with differing attachments to education. This is a further confirmation of the approach followed by the ETPNS group.

According to the Graham Commission, the general thrust of such a study should be towards anticipating the possible undesirable side effects, as well as maximum beneficial intended effects, and should seek to produce the most effective and efficient use of learning resources presently available in the province. This is additional support for the evaluation and pilot approach advocated here and for the philosophy of integration and coordination as expressed by the second major recommendation.

The orchestration of the day-to-day functioning of any re-organization probably should be entrusted in the Teaching Resources Clearing House. This would provide an organizing nexus for ordering the various key aspects of the learning environment which were focused on in Chapters 3 and 4. The Graham Commission seems to support this by recommending that a special section be set up to maintain a continuing surveillance on learning resources and teaching strategies and to provide assistance throughout the schools of the province, based on special studies and investigations.

The ETPNS and Graham Commission reports are not far apart in terms of the way they view the ultimate goal of the kind of coordinated approach advocated. Both stress accessibility of resources at all stages of the educational process among all classes of concerned individuals. The Graham Commission emphasis on general methods of accomplishing this goal, such as establishing community-based regional resource services[2], is complemented by the ETPNS approach of emphasizing the learning environment, wherever it may be, as well as the particularly important role of the teacher within this setting.

While both reports place an emphasis on local production facilities, this is viewed as a somewhat longer-term goal by the ETPNS. Primary attention should be paid to teacher education so that production facilities will receive a sympathetic and understanding base if and when they are provided. The Graham Commission places a similarly strong emphasis on a professional support and development program in the use of technology on a widely-accessible and equitable basis. Also stressed is the design of technologies which will enhance an active, student-involved basis of learning which could be built on knowledge developed in professional programs[1].

In order to provide the technology in an accessible fashion, both reports favour a regional resource model. Chapter 56 of the Graham Commission report has an impressive array of recommendations relating to media resource centres, which, when fully implemented, would lead to annual costs of some $8 million for the purchase of equipment and resource material.

The observations and sentiments which led the authors of the Graham report to such recommendations have been verified by the in-depth studies carried out in the Educational Technology Program. Not so clear, however, are the details of an implementation plan which could effect the recommendations; the ETPNS provided a logical continuation of the Graham Commission report in beginning work on this.

Out of the ETPNS studies have come a number of specific recommendations for immediate action, as well as recommendations which suggest areas requiring further analysis before appropriate steps can be taken. The ETPNS studies, for example, recommend that any decision to increase equipment holdings be by augmentation over a five year period at an annual rate of from $2 to $3 million. This supports the Graham Commission's recommendations related to increasing budget levels for purchase, rental and repair of equipment[4].

The ETPNS recommendation relating to the organization of regional and school resource centres or services is basically in agreement with the Graham Commission's, except that the position of Assistant Regional Director of Education—Libraries would be revised to encompass resources (not just libraries), to indicate the broader aspects of this position.

The ETPNS report also comments more about regional than local organization. This should not be construed as indicating that priorities lie with regions. The ETPNS has emphasized by placement of equipment and resources in schools, that the schools are the primary focal points for educational technology. Regional centres, on the other hand, should provide services that are either expensively provided at the school level, or ineffectively provided at the central level[5]. It is suggested that decentralization be tried at one regional location, on an experimental basis, and not in many locations as the Graham Commission recommends.

From a community point of view, the basic structure of the Graham Commission's resource-distribution system is a sound one. The concept of a decentralized system of regional resource centres, located in a community-accessible setting such as libraries, is a significant step towards encouraging community involvement in the learning environment. An attractive feature of such an arrangement would be the incentive provided towards the development of a computerized information-management system which would be required to keep an accurate, and up-to-date record of the disposition of the many resources these centres would contain[6].

An information-management system would also relate to any TRCH activities, such as the recommendation by the ETPNS study to establish a master file in Halifax, and to extend this system via a series of terminals located in regional libraries. This would facilitate the development of an integrated, locally-accessible information storage and retrieval system throughout the province as well as providing an effective method of organizing learning resources as expressed by the ETPNS recommendation on philosophy.

The ETPNS recommendation on philosophy and, especially, the recommendation on the information retrieval capability, stressed a national, coordinated approach involving all potential users and suppliers. Such an information retrieval and management system relates to similar recommendations of the Graham Commission. With minor differences, then, the approaches of the two reports, while not in perfect agreement, are nevertheless complementary. Thus, to a considerable extent, the recommendations of either report may be implemented without detracting from the possibilities raised by the other.

.6 The Outlook

The extent to which the intent of this report will merge with the kind of sweeping educational change proposed by the Graham Commission depends on several factors. Certainly, it will depend on the outcome of the pilot projects and evaluations proposed for a Phase II program. Moreover, it will depend on how faithfully the major recommendations of the report are implemented. Ultimately, it will depend on how well educators integrate the findings and recommendations proposed with the steps they take as individuals.

It is not impossible that a consensus on the role of technology in education will emerge, yet it is perhaps more realistic to accept a diversity of views

and a multiplicity of proposed solutions. Assimilating these views will not be easy, but it seems necessary if the alternative lack of consensus is examined.

The organization of the technological apparatus of society is well-advanced and relatively clear-cut compared to the methods available in managing technology. It is an axiom of our age that our capacity to initiate technological advances far outstrips our ability to come to terms with, or even predict, the results which these changes will have on society. Nor has an ethic been established which would halt technological advance until the time when rapid adaptations to technology are possible.

We are therefore at a disadvantage in dealing with technology—as long as it develops at its present rate—and must therefore press on with proposed solutions with great haste. Otherwise, we will inherit technological systems which do not fulfill their original purpose particularly well, or worse still, which have undesirable side-effects in areas quite apart from the original intent.

An attempt at obtaining a consensus regarding the methods of dealing with technology must therefore begin. It is important to establish some of the ground rules of this attempt from the outset, as a means of discussing them fully and of determining an approach. The approach advocated here proposes a balance between expediency and caution coupled with a mixture of both professional and popular involvement. The key words might well be established as **access** with **evaluation.**

Educators must not be afraid to implement the kinds of measures which they feel may assist them in using the technology to their best advantage. But they must be careful to monitor these measures very closely on a controlled basis before allowing any permanent changes to occur. It is clear that to accomplish this, there must be a broad and deep understanding of what technology is and what its effects are. It is therefore necessary to have access to the best techniques, and to the best advice concerning technology, in as broad a forum for organizing this understanding as possible.

Those who attempt to develop this understanding must have access not only the technology itself, in order to measure its effects, but also to the institutional mechanisms which enable them to deal with the technology. The Graham Commission proposes a number of these mechanisms as they relate to education in general, notably the establishment of School Councils[7]. A similar thrust is proposed, in a more limited fashion, in the emphasis which the ETPNS has given to the learning environment and to the teacher's particular place within this environment.

It is perhaps ironic that technology promises to create this broader kind of institutional access by enabling educators to communicate better, for example, an information network may be developed which will provide a wider understanding and an efficient means of organizing an attempt at turning technology towards the accomplishment of beneficial ends. Better communication must also mean better education, which, in the long run, will establish a more aware and capable population.

Ultimately, the kind of technological systems we seek can best be built by such a capable population. This very basic and vital goal of building knowledge and awareness must not be forgotten—but the technological means of achieving this goal cannot be allowed to replace the end in sight. Just as certification can never be equated with education, neither can technological systems be equated with the advance of learning. The success or failure of any technological advance must be observed in operation and judged in terms of the net benefits which people derive from using technology.

The key to this kind of evaluation lies in the kind of organizational basis for access and multi-faceted involvement suggested by this report. For through access and involvement, the misunderstandings surrounding technology may be stripped away. This, in turn, opens the path towards a clear-sighted view of what technology entails and how an alternative to using learning simply for the sake of advancing technology may be created by using existing technology first to advance learning. Such an alignment of priorities should put the values of learning and technology into a proper perspective, and will ensure the cultivation of the knowledge necessary to meet the changes posed by future developments in the province.

Footnotes to Chapter 5

1. ETPNS, Working Paper No. 6425, *op. cit.*
2. The Royal Commission on Education, Public Services, and Provincial-Municipal Relations, *op. cit.*, III/56/44.
3. *Ibid.*
4. *Ibid.* pp.56-1, 56-15.
5. ETPNS, "Media Resource Centres and Distribution of A.V. Materials", Working Paper No. 6421, pp. 36-43.
6. ETPNS, "Community Involvement in Educational Technology", Working Paper No. 6421, pp 3.4.2–3.4.6.
7. The Royal Commission on Public Services, and

Provincial–Municipal Relations, *op. cit.*, Recommendations III/43/10–III/43/14.

Appendix A—Program Staff

Review Committee:

Dr. H.M. Nason,
Deputy Minister of Education,
Province of Nova Scotia

Mr. Gordon F. Coles,
Deputy to the Minister Responsible for Communications,
Province of Nova Scotia

Dr. John de Mercado,
Director General,
Educational Technology Branch,
Federal Department of Communications

The role of the Review Committee was to oversee the progress of Initial Phase activities during the ETPNS study and to act on any reports submitted to it by the Executive Committee regarding changes in ETPNS. This committee was also to review, and amend if necessary, the formal recommendations submitted by the Steering Committee in its written report at the end of the Initial Phase. The findings here would be forwarded to the ministers involved for their decisions concerning the disposition of any subsequent phases of the Educational Technology Program for Nova Scotia.

Executive Committee:

Nova Scotia

Dr. Gaylen A. Duncan, (Chairman),
Coordinator of Communications Policy,
Province of Nova Scotia.

Mr. W.F. Garth, Director,
Teaching Resources Clearing House,
Department of Education, Nova Scotia.

Mr. B.F. Hart, (Executive Secretary),
Supervisor, Audio-Visual Instruction,
Department of Education, Nova Scotia.

Mr. J.G. McDonald,
Supervisor of Audio-Visual Services,
Department of Education, Nova Scotia.

Mr. H.K. MacKay,
Assistant Chief Director of Education,
(Planning and Budgeting),
Department of Education, Nova Scotia (*ex officio*).

Educational Technology Branch

Dr. T.A.J. Keefer, Program Manager,
Educational Technology Branch,
Federal Department of Communications.

Mr. D.W. Bassam, Program Director,
Educational Technology Branch,

Federal Department of Communications (*ex officio*).

The Executive Committee was responsible for defining the activities of the Initial Phase, for allocating personnel and financial resources in order to conduct these activities, and for monitoring the progress of the Initial Phase. The Executive Committee received comments from the Steering Committee, and reports to the Review Committee; it also formed sub-committees as required during the course of the program.

The Executive Committee was also responsible for producing the final Initial Phase report, and for obtaining approval from the Steering Committee before forwarding it to the Review Committee.

Steering Committee (by sub-committees):

Executive Committee (see above)

Educational Committee:

Mr. T.M. Jones (Chairman),
Assistant Director, Adult Education,
Department of Education, Nova Scotia.

Mrs. Carolyn Drysdale,
Nova Scotia Federation of Home and School Associations.

Mrs. Carin Somers, Assistant Director,
Cultural Services,
Department of Education, Nova Scotia.

Mr. D.H. Montgomery,
Nova Scotia School Boards Association.

Mr. H.P. Timmons, Director,
Adult Education Program,
Department of Education, Nova Scotia.

Technical Committee:

Mr. Charles Nakel (Chairman),
CN-CP Telecommunications.

Senator Irvine Barrow,
Atlantic Cable TV Consortium.

Mr. Tony Gibson,
Director, A.V. Division,
Faculty of Medicine, Dalhousie University.

Mr. Ken Hill,
Canadian Broadcasting Corporation.

Mr. Al Pothier,
Maritime Telephone and Telegraph Company.

Mr. John Twaites, Atlantic Region,
Federal Department of Communications.

Mr. Fred Waller,
Regional Advisor on Telecommunications,
Council of Maritime Premiers.

Finance Committee:

Mr. H.K. MacKay (Chairman),
Assistant Chief Director of Education, (Planning and Budgeting),
Department of Education, Nova Scotia.

Mr. R. A. Johnson, Secretary,
Nova Scotia Treasury Board.

Dr. A.S. McDonald, Director of Research,
Department of Education, Nova Scotia.

Mr. Armand Pinard,
Nova Scotia Department of Development.

Project Leaders (Other than Executive Committee members)

Nova Scotia

Dr. Gary Anderson
Dr. D.L. Burt
Mr. Eric Cowan
Mr. Emmet Currie
Mrs. Carolyn Drysdale
Ms. Freida Hjartarson
Dr. J.A. Lauwerys
Dr. Richard Lewis
Dr. A.B. Morrison
Mrs. Carin Somers
Mr. H.P. Timmons

Educational Technology Branch

Mr. Roger Beaudry
Mr. John Da Silva
Dr. Ron Elliott
Mr. Murray Fyfe
Dr. Samy Mahmoud
Dr. Tom Richardson
Mrs. Linda Steingarten

Consultants

Mr. Barry de Ville
Mr. Charles McManus
Dr. Elizabeth Morton
Mr. Dan Rice
Mr. Kal Toth
Dr. Fred Whitworth

Appendix B ETPNS Studies

The Executive Committee sub-divided the activities of the Initial Phase into numerous projects requiring specific studies which were subsequently approved by the Review Committee. These projects are listed below (with project leaders and number shown in parenthesis):

Study of Teacher Instruction in Use of Educational Technology (Dr. D.L. Burt No. 6426)

Training of Media Technologists (Dr. Richard Lewis No. 6412)

Survey of Existing Provincial and Regional Software Resources (Mr. B.F. Hart No. 6404)

Survey of Educational Equipment and Materials (Mr. J.G. McDonald and Mrs. Linda Steingarten No. 6405)

Network Resources Study (Mr. John da Silva No. 6406)

Analysis of Television Distribution Systems (Dr. Samy Mahmoud No. 6420)

Assessment of Policies Related to Standardization, Purchasing and Maintenance of Educational Technology Equipment and Software (Mr. Roger Beaudry No. 6408)

Study of Educational Communications Policies (Dr. Gaylen A. Duncan No. 6414)

Media Centres and Distribution of Audio-Visual Materials (Dr. Tom Richardson and Mrs. Carin Somers No. 6421)

Impact on Regional Libraries and Schools (Dr. Elizabeth Morton No. 6421)

Distribution and Repair Services (Mr. Dan Rice No. 6421)

Preliminary Computer/Communications Study for High Schools (Mr. Kal Toth No. 6410)

The Use of Computers in Instruction and in Educational Administration (Dr. Ron Elliott No. 6413)

Preparation of Recommendations (Dr. T.A.J. Keefer No. 6404)

As background to these studies numerous reports were prepared on general concerns related to educational technology. A list of these reports follows:

Field Seminars with Teachers (Mr. B.F. Hart and Mr. J.G. MacDonald No. 6425)

Views of Students (Mr. J.E. Hemphill No. 6429)

Evaluation of Educational Technology Applications (Dr. Fred Withworth No. 6411)

Educational Technology for Pre-Schoolers (Ms. Freida Hjartarson No. 6428)

The Role of Educational Technology in Youth Education (Dr. A.B. Morrison No. 6430)

The Role of Educational Technology in Continuing Education (Mr. H.P. Timmons No. 6419)

Community Involvement in Educational Technology (Mr. Barry deVille No. 6421)

In addition to these reports the ETPNS sought more qualitative information and therefore requested that numerous personnel and organizations state their views. Briefs were submitted by various organizations, including the following:

Atlantic Institute of Education (Dr. J.A. Lauwerys No. 6407)

Department of Education (Mr. W.F. Garth No. 6409)

Nova Scotia School Boards Association (Mr. Eric Cowan No. 6415)

Teaching Resources Clearing House (Mr. Emmet Currie No. 6417)

Nova Scotia Teachers Union (Mr. Emmet Currie No. 6427)

Nova Scotia Federation of Home and School Associations (Mrs. Carolyn Drysdale)

The total cost of the Initial Phase was $80,000 in addition to 72 man-months of work. Several working papers on Initial Phase projects are available from the Nova Scotia Department of Education on a restricted basis.